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The Renal Extraction of p-Aminohippurate in the Aged Individual

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PREVIOUS communications from this laboratory (2, 5, 6) have reported progressive decreases with age in the clearance of inulin and diodrast and in the maximal tubular excretory rate for diodrast in subjects between 30 and 90 years of age. More recent studies (4) have demonstrated a similar progressive decrease in p-aminohippurate clearance.

The validity of diodrast or p-aminohippurate clearance as a measure of renal plasma flow in the normal young subject has been established (1, 7, 8, 9). However, decreased tubular function in the older individual, as evidenced by a decrease in the maximal rate of diodrast excretion, raised doubt as to the validity of the assumptions involved in the use of diodrast or p-aminohippurate clearance as a measure of renal plasma flow in the aged.

The present study of the renal extraction of p-aminohippurate (PAH) at low plasma levels was undertaken to determine whether renal plasma flow is actually reduced with age or whether impaired tubular function may be responsible in part or whole for the observed decreases in clearances.

METHODS

Normotensive subjects, who were free of clinical evidence of cardiovascular and renal disease, were selected from the wards of the Baltimore City Hospitals and from the Baltimore City Hospitals Infirmary Division (Old People's Home). Twenty-five male and 2 female subjects, who ranged in age from 23 to 75 years, were tested.

All subjects were studied in the post-absorptive state. Following the intravenous administration of a priming dose of PAH and the initiation of a sustaining infusion designed to maintain plasma PAH levels at 1-3 mg. per cent, a No. 8 radiopaque intravenous catheter was introduced into an antecubital vein and, under fluoroscopic observation, was passed into the right renal vein via the superior and inferior venae cavae. Arterial blood was sampled through an indwelling needle in the femoral artery. Three to twelve successive simultaneous samples of arterial and renal venous blood were obtained over a period of thirty minutes to two hours.

In 21 of the 27 subjects, urethral catheterization was performed, and the renal clearance of PAH (3) was determined during 3 to 8 urine collection periods of twelve minutes duration. In these subjects, arterial and renal venous blood samples were obtained simultaneously at the mid-point of each urine collection period.

The per cent of PAH extracted by the kidney was expressed as $\frac{A\text{-}V}{A} \times 100$, where A and V represent the plasma concentrations of PAH in arterial and renal venous samples, respectively. The clearance of PAH was obtained by dividing the rate of urinary excretion of PAH by the arterial plasma concentration of PAH. The renal clearance and extraction value for each individual was expressed as the mean of all obtained values.

PAH determinations were performed in duplicate on cadmium sulfate filtrates of plasma and on diluted urine (8).

RESULTS

The per cent renal extraction of PAH at low plasma levels ranged from 86.5 to 96.8 with a mean of 91.3 (S.D. distr. = 2.5) for the entire group of subjects.

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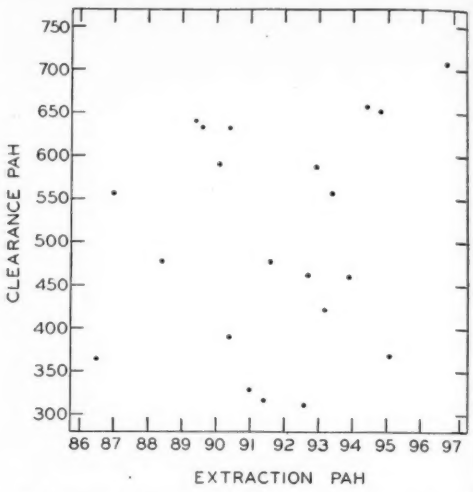

FIG. 1. Absence of correlation ($r = .175$) between the renal clearance of PAH expressed as cc. per minute per 1.73 square meters body surface and renal extraction of PAH expressed as per cent. $N = 21$.

In table 1, the renal extraction values are shown by decades. In table 2, the subjects have been divided into two groups, those under 50 years of age and those 50 years of age and older. Values for 20 young normal subjects under 50 years of age studied by Bradley (1) are included for comparison. The mean PAH extraction of 91.8 (S.D. distr. = 2.9) for the young group is not significantly different from the mean extraction of 91.1 (S.D. distr. = 2.5) for the old group of individuals.

Figure 1 shows that there was no significant correlation ($r = .175$) between PAH clearance and the renal extraction of PAH in the 21

TABLE 1. RENAL EXTRACTION OF PAH ACCORDING TO AGE DECADES COMPARED WITH CLEARANCE OF PAH

Age (Years)	Extraction of PAH			Clearance of PAH	
	Per Cent			(cc./min./1.73 sq. m.)	
	N	Range	Mean	N	Mean
20-29	4	89.4-92.9	90.7	4	612
30-39	..	.....	....	..	...
40-49	4	88.0-96.8	93.0	3	529
50-59	7	87.0-95.1	92.5	7	512
60-69	9	86.5-91.7	89.6	5	439
70-79	3	91.1-92.7	92.1	2	386

TABLE 2. RENAL EXTRACTION OF PAH ACCORDING TO AGE

Less than 50 Years of Age	N	Age Range (Yrs.)	Mean Age (Yrs.)	Extraction Range (Per Cent)	Mean Extraction (Per Cent)	
					Mn	σ_d
Present Study	8	23-49	35.3	88.0- 96.8	91.8	02.9
Bradley (1)	20	18-49	29.8	87.8-100.0	92.5[1]	02.5
50 Years of Age and Older						
Present Study	19	50-75	62.2	86.5- 95.1	91.1	02.5

[1] Mean = 92.1 if a single value of 100.0 obtained in one individual is omitted.

individuals (age range from 23 to 75 years) in whom simultaneous clearance and extraction data were obtained. The effective renal plasma flow value (C_{PAH}) for each subject was within two standard deviations of the mean value for his specific age group, as determined by Davies and Shock (2).

DISCUSSION

The renal clearance of diodrast or PAH is a measure of renal plasma flow by virtue of the fact that diodrast and PAH, at low plasma levels, are almost completely extracted from the plasma during a single passage through the normally functioning kidney. The relatively small percentage of PAH that is not extracted (viz., less than 10 per cent) in all probability represents that fraction of plasma which supplies nonexcretory tissue such as the renal capsule and pelvis. Thus, the value of C_{PAH} is dependent upon not only the renal plasma flow, but also upon the relative distribution of plasma to functioning parenchymal units and upon the ability of the tubular cells perfused to extract PAH completely at low plasma levels.

Inasmuch as decreased tubular function, as measured by the maximal excretory rate of diodrast, has been demonstrated in the older individual, the observed depressions in PAH and diodrast clearances with age must be further evaluated, and the relative importance of decreased plasma flow and impaired tubular function as factors contributing to decreased clearances must be assessed.

The observation that the fraction of PAH extracted by the kidney of the older individual is the same as the fraction extracted by the kidney of the young individual demonstrates that the clearances of PAH and, by inference, diodrast are valid measures of plasma flow in the aged and that the previously observed decreases in C_{PAH} and C_D with age are representative of an actual decrease in renal plasma flow.

The unchanged renal extraction of PAH with age further indicates that the relative distribution of renal plasma flow to parenchymal and nonparenchymal tissue is the same in the old as in the young, that there is neither an absolute nor a relative increase in the nonexcretory tissue perfused in the kidney of the older individual, and that the individual tubules in the senile kidney which are perfused maintain their ability to extract PAH completely at low plasma levels.

Thus, renal plasma flow as well as tubular excretory capacity is decreased with age. Although, on the basis of available physiologic data, no definite conclusions can be drawn with regard to the primacy of either vascular or cellular impairment, primary vascular impairment resulting subsequently in decreased tubular function would seem to be a more reasonable interpretation than the hypothesis of pri-

mary cellular degeneration followed by a decrease in plasma flow. Furthermore, the primacy of vascular rather than cellular impairment is supported by disproportionate diminution of function with advancing years.

From the data of Davies and Shock (2), the ratio of C_D/Tm_D is significantly lower in the old than in the young individual. Since it has been demonstrated by renal extraction studies that C_{PAH} and, by inference, C_D are valid measurements of renal plasma flow in the old, the decrease in the ratio of C_D/Tm_D with age suggests that vascular impairment precedes a decrease in tubular function.

Conversely, the occurrence of primary tubular involution or degeneration followed by a decrease in plasma flow is controverted by the observation in the present study that perfusion of nonfunctioning tissue is not measurably greater in the old than in the young. The maintainence of a normal renal extraction of PAH is evidence that tubular functional impairment or tubular arophy does not proceed in advance of diminution of vascular supply.

Summary

The renal extraction of PAH at low plasma levels was determined in 27 subjects who ranged in age from 23 to 75 years.

The renal extraction of PAH was not related to age, although the clearance of PAH in the present study, as in previous studies, was decreased in older individuals.

Since the renal extraction of PAH does not change with age, it is concluded that (a) the clearance of p-aminohippurate is a valid measure of renal plasma flow in the old as well as in the young, (b) the previously observed decreases in the clearance of diodrast and p-aminohippurate in older individuals are caused by an actual decrease in renal plasma flow, (c) the relative distribution of renal plasma flow to excretory and nonexcretory tissue is the same in the old as in the young, and there is no measurable increase in the amount of nonparenchymal tissue perfused in the kidney of the old individual, and (d) the individual tubules of the old kidney retain their ability to extract PAH completely at low plasma levels.

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Studies in Experimental Atherosclerosis. III. Anatomic Alterations Induced by Intravascular Injection of Cholesterol Sols into Animals

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While the number of investigators who introduced cholesterol or fat suspensions containing cholesterol into the blood stream of animals is rather large, (for bibliography, see article II of this series, *J. Gerontol. 6:* 127-131) few of the scientists paid attention to anatomic alterations initiated by such experiments. It seems to us desirable to summarize all information on the subject which is available because the problem is of interest to all students of atherosclerosis.

Historical Data

Entirely negative findings were reported by Cashin and Moravek (3) on 9 cats injected with cholesterol-lecithin suspension. Cholesterol storage in the reticulo-endothelial cells of the liver, spleen, adrenals, and connective tissue comparable to that commonly seen after cholesterol feeding were recorded by Deicke (4), who injected intravenously 0.6 per cent cholesterol and 1.2 per cent olive oil into rabbits. No vascular lesions were found in these animals.

Kaufer (6) visualized cholesterol in liver capillaries of rabbits injected intravenously with 3 to 5 per cent cholesterol hydrosol over 396 days during which period 19 Gm. of cholesterol were administered to each animal. He explained the fact that cholesterol was not found elsewhere in the body by stating [erroneously] that there is no chance for esterification of cholesterol outside the liver. Wohlwill (10) observed in 2 dogs, injected into the femoral vein with cholesterol in sunflower oil, crystals of cholesterol in the subintima of the portal vein.

Seeman (9) as well as Merkulow (8) described intimal granuloma formation in pulmonary arteries of animals injected into the ear vein with cholesterol sol. Some of these animals were sacrificed as early as twenty minutes after a single injection. Other animals were allowed to survive up to sixty days. Their series comprised 11 rabbits and 2 dogs injected once and 6 rabbits and 2 dogs injected repeatedly with cholesterol suspension.

Dewey (5) injected one rabbit intravenously with 5 cc. of a 10 per cent cholesterol suspension three times a week until a total of sixteen injections were made. A second rabbit received daily injections for thirty days, the first ten doses being 5 cc. and the following twenty doses 10 cc. of suspension, each. Three other rabbits were injected intermittently intravenously and intraperitoneally. The degree of tissue damage was out of proportion to the dose of cholesterol introduced. Severe damage to the liver and kidneys was present and also slight changes in the aorta.

Alterations in the aorta of rabbits were seen by Klotz (7) after intravenous injections of 1 to 2 cc. of cholesterol-sodium oleate suspension 2 to 3 times a week for a period up to three months. The lesions were similar to those commonly encountered in rabbits fed cholesterol. In contrast to this series, rabbits injected 2 to 3 times a week for from six days to three months with 0.5 to 2 cc. of colloidal cholesterol in olive oil showed no evidence of damage to the aorta. The endothelium of the capillaries and smallest arterioles of these rabbits was actively proliferated up to obliteration of the lumen. In large arteries, such proliferation was paired with splitting of the elastica, breakage, poor staining, and atheroma-like calcium deposits in the vessel wall. However, olive oil injected without cholesterol caused similar alterations but the lesions were of lesser degree than when cholesterol was added to the oil.

Bevans, Abell, and Kendall (1, 2) injected rabbits of 2.5 Kg. weight intravenously with 0.5 per cent cholesterol stabilized with sodium

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stearate. Severe atheromatous lesions were seen upon administration of 14.5 Gm. of cholesterol over a period of thirty-six days. Gross alterations were present in the ascending aorta within thirteen days during which 6.5 Gm. of cholesterol were injected. The earliest positive finding was made three hours after injection.

Experimental

Anatomic alterations in animals injected intravascularly with cholesterol sols were reported only sporadically. Observations were made on small series of animals injected repeatedly over a long period of time. There is very little uniformity to be found in the reports made to date. Klotz (7) admitted the damaging effect of injection of olive oil, the vehicle used for cholesterol by him and others. Similar action by other stabilizers is suggested. Thus, the basis for our experiments was established.

Two different colloidal suspensions of cholesterol stabilized in partially deproteinized rabbit serum were employed in our study. The size of micels measured in the dark field and estimated nephelometrically equaled 0.2 to 0.4 μ in the "coarse" and 0.02 to 0.04 μ in the "fine" suspension.

The technic of injection was modified in the course of the study. At first large doses were injected. These required a large volume of vehicle, and infusions had to be made slowly. With smaller amounts of cholesterol, the volume injected could be reduced and the injection made faster. Using a 17 to 18 gauge needle and a 10 cc. syringe, the intravascular injection of a coarse suspension of cholesterol could be completed within two minutes and that of a fine suspension within ninety seconds when the total volume was smaller than 10 cc. More rapid injection was not tolerated by the animals. Employing this technic, the pressure did not seem unduly high.

The rabbits were sacrificed by transverse section of the neck, a method which proved more rapid and less painful than any other. Many of the animals were killed immediately, that is, within thirty seconds upon completion of an injection. Other animals were allowed to live for from three minutes to nine days.

All organs, including the large vessels, were examined grossly and microscopically. Multiple sections were made and stained by the conventional methods.

Depending upon the mode of injection, the type of suspension used, the number of applications, and the survival time, the animals were divided into several unevenly large series. All rabbits used for the study were obtained from the same source and were of uniform breed and age. The number of male animals exceeded that of females; separation according to sex was of no significance for this report.

The first series comprised 10 rabbits. Their average weight was 3.37 Kg. A single intravenous injection of a coarse cholesterol suspension was made into the ear vein. Four rabbits received 20 cc. of the suspension containing 492, 474, 416, and 378 mg. of cholesterol, respectively. Three rabbits were injected with 10 cc. containing 246, 188, and 99 mg. of cholesterol. Three more rabbits were given injection of 1.5 cc. with 25 mg., 0.8 cc. with 16 mg., and 0.5 cc. with 10 mg. of cholesterol, respectively. The amount of cholesterol introduced per Kg. of body weight was 90.3 mg. in the first and only 5 mg. in the last animal of the series.

In the rabbits treated with large doses, 188 to 492 mg. of cholesterol, widespread damage was observed on microscopic examination of the organs. Multiple emboli were seen in small pulmonary arterioles. Acicular spaces corresponding to cholesterol crystals embedded in blood clots were seen in many veins and, occasionally, also in an artery. Minute focal necroses were observed in the lungs and in the brain. Fatty change was present in the central portion of liver lobules, in the adrenal cortex and, sometimes, in renal glomeruli. Steatosis was absent in animals sacrificed immediately upon injection but was present in all rabbits killed after ten minutes or later. Vascular alterations were present in all rabbits and consisted of foam cell collections in the subintima of pulmonary arterioles and small arteries.

The rabbits injected with small doses of cholesterol, 10 to 99 mg., presented an entirely different picture. No acicular spaces were seen. No emboli were detected. Steatosis was absent. Alterations were confined to the blood vessels in all these rabbits. Foam cells aggregates of varying size and extent were seen in the subintimal layer of arterioles and in the small and medium sized arteries of the lungs. The findings were the same in a rabbit killed after thirty seconds as in 2 rabbits sacrificed after three minutes. One rabbit injected with 25 mg. of the coarse cholesterol sol and killed ninety minutes later had lesions in small, medium sized, and also in large pulmonary arteries. One of the patches in a small artery showed distinct signs of fibroblastic proliferation. In this animal, a subintimal plaque was seen in sections from the ascending aorta.

The second series of 5 rabbits was given two to three intravenous injections of a coarse cholesterol suspension. The average weight of the rabbits was 2.5 Kg. The largest single dose equaled 400 mg. and the smallest 40 mg. of cholesterol. The total amount of cholesterol introduced was 800 mg. in the first rabbit, or 352 mg. per Kg. of body weight, while the smallest amount administered was 182 mg., or 42 mg. per Kg. weight. The interval between two injections varied from ten minutes up to seventy-two hours. Three rabbits were killed upon injection, 1 was sacrificed ten minutes, and 1 twelve hours after the last injection.

All rabbits were affected in the same way. The animals injected with large doses were harmed more than those treated with small doses. All rabbits had steatosis of the liver and fat deposits in the glomerular capsule and loops. Subintimal foam cell collections were seen in pulmonary arterioles and small arteries of all rabbits. The animal injected with two doses of 400 mg. each presented, in addition to pulmonary lesions, foam cells in the ascending aorta. These rabbits also showed focal cerebral necroses surrounded by hemorrhage; acicular spaces were seen within these extravasates.

It became obvious that the size of cholesterol particles was frequently too large to pass pulmonary and cerebral capillaries. Crystallization of cholesterol occurred only very rarely in the lumen of an artery but rather often within the veins and extravascular blood. For these reasons, coarse suspensions were replaced by fine cholesterol sols in further series.

The third series was the largest of all. Thirty rabbits of a uniform weight of 2.59 Kg. were given a single dose of fine cholesterol suspension. Again the dose injected intravenously was gradually decreased to ascertain the minimum effective amount of cholesterol. The largest amount injected equaled 226 mg. and the smallest dose was 65 mg. In relation to body weight, the maximum dose was 106 mg. per Kg. and the minimum dose was 14.3 mg. Animals were sacrificed promptly upon completion of injection, or they were allowed to live for 5, 10, 15, 20, 30, 60, or 90 minutes. Two rabbits were killed after twelve hours.

Only the 2 animals allowed to survive for twelve hours had fat deposits in the liver. All but 2 of the 30 rabbits of this series showed subintimal foam cells. The first of the 2 "negative" rabbits had received 80 mg. of cholesterol, or 40.8 mg. per Kg. body weight, and was killed fifteen minutes after injection. On the other hand, 4 rabbits treated in exactly like manner had multiple vascular lesions. The second "negative" rabbit was sacrificed imme-

diately upon injection of 65 mg. of cholesterol, or 14.3 mg. per Kg. body weight . Again, 4 other rabbits treated similarly presented rather extensive vascular alterations.

Commonly, pulmonary arterioles, small and medium sized arteries were affected. Four rabbits also showed involvement of larger branches of the pulmonary artery. In 6 animals, the ascending aorta was damaged; in 4, the coronary arteries; in 1, a pericardicophrenic artery; and in 2, the small renal arteries.

The total volume injected and the dose of cholesterol introduced varied but moderately. Therefore, no relation of the extent and degree of lesions to the amount of cholesterol injected could be expected or found. Neither was there any significant relation between lesions and the survival time, as long as the animals were sacrificed within thirty minutes. In rabbits allowed to live longer, some subintimal patches were seen in which fibroblasts and some lymphocytes appeared between the foam cells and had replaced some of these cells. The intima above the deposits of foam cells seemed thickened.

The fourth series consisted of 15 rabbits whose average weight was 2.47 Kg. They received from two to four intravenous injections of a fine cholesterol suspension. The largest total amount introduced equaled 185 mg. and the smallest 80 mg. The maximum dose per Kg. body weight was 70.9 mg. and the minimum dose 35.2 mg. The single dose injected varied from 33.5 to 62 mg. The interval between two injections lasted from ten minutes to seventy-two hours. Rabbits were sacrificed immediately after injection, 5, 10, 20, 60 minutes, or 17, 24, 48, and 72 hours later. One rabbit was killed 5 and one 7 days after the fourth and third injection, respectively.

All animals in this series had vascular alterations of pulmonary arteries of various diameters. Twice, the coronary arteries were also involved. Three rabbits had patches in the ascending aorta. The volume injected and the amount of cholesterol administered did not seem significant. The interval between injections seemed of importance. Rapid succession of injections, in intervals of ten minutes, resulted in a larger number of lesions as compared with animals injected in twenty-four to forty-eight hours intervals. The survival time was also important. In sections of tissues from viscera of rabbits allowed to live for five to seven days after the injections it was necessary to search about ten times as many microscopic fields to find a damaged artery as in animals killed shortly after injection. Also these subintimal patches showed signs of organization.

The fifth series was small. Two rabbits were injected intracardially with a coarse cholesterol suspension. The first animal received 244 mg. and was killed one minute after injection. Vascular lesions were found in the large pulmonary arteries, a carotid artery, and to a slight degree in the aorta. Superficial damage characterized by ballooning of intimal cells was seen in the inferior vena cava. The second rabbit was injected with 55 mg. of cholesterol, or 31 mg. per Kg. weight. It was killed five minutes later. The aorta alone was altered by subintimal foam cell patches.

The sixth series numbered 10 rabbits injected with fine sols. Five rabbits were injected intracardially. The cholesterol dose was from 67 to 176 mg. Two rabbits were injected in the carotid artery, one with 134 and the other one with 110 mg. To 3 rabbits, the injection was made into the exposed abdominal aorta. Puncture was made just below the diaphragm. The doses used were 165, 102, and 55 mg., respectively. The dose per Kg. varied between 25 and 96 mg. as the average weight of these rabbits was 2.19 Kg. Some animals were killed promptly; actually, before completion of the injection.

As in the previous series, the results differed from those obtained by intravenous injection. Only 3 of the 5 rabbits injected intracardially showed subintimal foam cell collections in the pulmonary arteries. None of the rabbits injected intraarterially or into the aorta had any pulmonary vascular lesions. Two rabbits had marked aortic damage and one had also

coronary and renal arterial lesions. Cerebral and renal arteries, a single muscular artery, and the large veins were affected in 1 of the animals injected into the aorta. All 3 rabbits injected into the aorta showed damage to renal arterioles and arteries.

The seventh series numbered 3 rabbits. Intravenous injection was followed by intracardial injection. The interval between two infusions was 10 minutes, 24 hours, and 9 days, respectively. The first rabbit was sacrificed 5 minutes, the second 15 minutes, and the third 7 days after the second injection. A fine cholesterol sol was used. The total doses injected were 245, 243, and 191 mg. The maximum single dose equaled 176 mg. and the minimum dose was 21 mg. The average weight of rabbits was 2.3 Kg.

The results were analogous to observations made on rabbits injected intravenously. In all 3 animals, alterations were confined to small and medium sized pulmonary arteries. There was, however, a difference in the lesions seen. In the first rabbit of this series, the usual subintimal foam cell collections were seen, while in the other 2 rabbits, organization of these lesions was demonstrable.

The eighth series comprised 7 rabbits. Their average weight was 2.6 Kg. Five animals received intravenously hypercholesteremic serum and 2 were injected with material from ovarian cysts containing a large amount of cholesterol in extremely fine suspension. The total volume of fluid introduced was large and infusions had to be made slowly. Otherwise, the arrangement was the same as in other series.

The 5 rabbits injected with human serum received from 84 to 145 mg. of cholesterol, or from 32 to 60 mg. per Kg. weight. The 2 rabbits injected with material obtained from ovarian cysts were given 1,000 mg. and 1,500 mg. cholesterol, respectively. The animals were sacrificed promptly, or up to ten minutes after injection.

The findings in this group differed considerably from those reported for the other series. None of the 7 animals showed even the slightest vascular damage. All the rabbits had marked steatosis of the liver, especially the central portion of the lobules, and fatty change of the adrenal cortex and of renal glomeruli. Multiple minute collections of lymphocytes were seen in the lung parenchyma, in the brain matter, occasionally in the myocardium, and in one instance also in the renal cortex. Fat emboli were present in small arteries of many viscera. The embolized vessels showed edema of the outer layers of the muscularis and some were cuffed by a moderate lymphocytic exudate.

A ninth series of rabbits was injected with a "fine" suspension of colloidal graphite. Six animals were injected intravenously and 2 intracardially. In all respects, the results of this experiment corresponded to the findings after injection of fine cholesterol sols. Localization of graphite particles, which were easily identified in tissue sections, was the same as that of cholesterol. Endothelial cells loaded with these particles were seen in the subintima of arteries. Graphite was also present in the reticuloendothelial cells of the viscera and in the connective tissues. The degree of damage was not as great as after cholesterol injection.

A tenth series numbered 10 rabbits. These were injected with a fine colloidal suspension of sodium stearate which was prepared in exactly the same way as the cholesterol suspensions. The arrangement mirrored the experiments with fine cholesterol sols. While the distribution of lesions was the same as after injection of cholesterol and localization depended upon the route of injection, the degree and extent of alterations seemed greater than that observed after introduction of cholesterol into the circulating blood.

Analysis

Our observations differ from those of other investigators. Dewey (5) reported slight changes in the aorta of 2 rabbits. One had received sixteen injections of a total of 800 mg. of cholesterol. The second rabbit was injected daily for thirty days and the total dose of cholesterol equaled 2,500 mg. Klotz (7) described vascular damage in rabbits injected 24 to 36 times with a total amount of 275 to 525

mg. cholesterol administered over a period of three months. Bevans, Abell, and Kendall (1, 2) injected 14,500 mg. of a cholesterol suspension stabilized with sodium stearate over a period of thirty-six days. Within thirteen days, 6,500 mg. cholesterol were injected intravenously into another rabbit. The earliest aortic lesions were seen three hours after injection. Seeman (9) and Markulow (8) observed intimal granuloma in pulmonary arteries as early as twenty minutes after intravenous injection of a cholesterol sol. Their total series of animals numbered 17 rabbits and 4 dogs.

The amount of cholesterol introduced by us into the circulation of rabbits was considerably smaller than the quantities used by others. The smallest damaging dose of cholesterol was 10 mg., corresponding to 5 mg. per Kg. body weight, where a coarse suspension was used. The smallest effective dose for fine cholesterol suspension was 65 mg., equal to 14.3 mg. per Kg. body weight. Because of isolated "negative" results with such doses no further reduction in the amount injected was attempted. With extremely finely dispersed particles such as appear in the blood serum of patients with myxedema or in the content of ovarian cysts, no vascular alterations could be elicited.

The elevation of blood cholesterol levels in our animals, as determined by the Sperry-Schoenheimer methods, was negligible in comparison with the hypercholesteremia produced by other investigators. As a rule, no increase was found after injection of cholesterol. None of the chemical methods available are sufficiently sensitive to allow determination of fractions of milligrams and conclusions from single determinations. Mostly, the periods between two injections given to a single rabbit were short and not over four injections were made to one rabbit. Experiments of others stretched over a long period of time and a great number of injections were given. Various routes of intravascular administration were applied by us whereas the intravenous route alone had been used by others. The animals were killed as early as thirty seconds after intravascular injection while only a sporadic reference to examination of animals twenty minutes after injection was found in the literature.

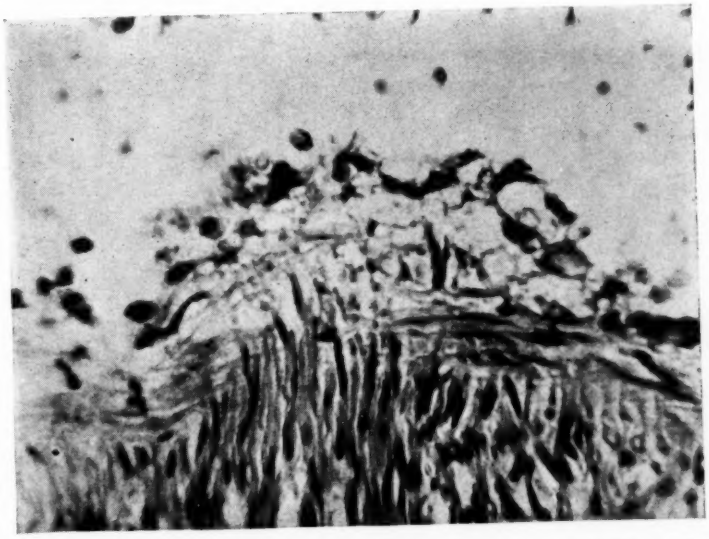
One of the objections to the experimental approach by intravascular injections was the type of vehicle used for the cholesterol. Klotz (7) obtained vascular lesions upon injection of olive oil. We produced severe vascular alterations by injection of sodium stearate in doses analogous to the damaging amount of cholesterol. Partially deproteinized rabbit serum, the material which served in our experiments as physiologic stabilizer for cholesterol, proved ineffective when infused alone into rabbits. To our control series, injections of such serum were given in doses from 1 to 20 cc.

The results of our experiments suggest that colloidal particles are precipitated upon the vascular intima of rabbits when introduced directly into the circulation. The larger the particles injected, the more severe the damage encountered. With very fine suspensions the vascular intima could not be damaged in our series. Results of injections with sodium stearate suspension and graphite sol suggest that the effect upon the blood vessels is nonspecific, that is, not a typical cholesterol effect. There is a possibility that cholesterol, or rather cholesterol esters, are deposited secondarily in vessels damaged primarily by other macromolecular substances.

Observations made on animals injected by various routes showed that the distribution of vascular lesions depended upon the mode of injection. After injection into the ear vein, the pulmonary vessels were affected, predominantly. Injection into the aorta or heart resulted in damage to the blood vessels of the major circulation. Apparently large colloidal micels precipitated promptly in the vascular bed nearest to the site of injection. One might compare such a phenomenon to sedimentation of gravel when dumped into a running stream of water.

From studies of rabbits sacrificed at various intervals after injection it seemed that subintimal deposits were resorbed and that this resorption began as early as ten minutes after

ANATOMIC ALTERATIONS OBSERVED ON THE BLOOD VESSELS OF RABBITS INJECTED INTRAVASCULARLY WITH CHOLESTEROL SOLS OR WITH A COLLOIDAL SUSPENSION OF SODIUM STEARATE AND SACRIFICED AT VARYING INTERVALS AFTER INJECTION.



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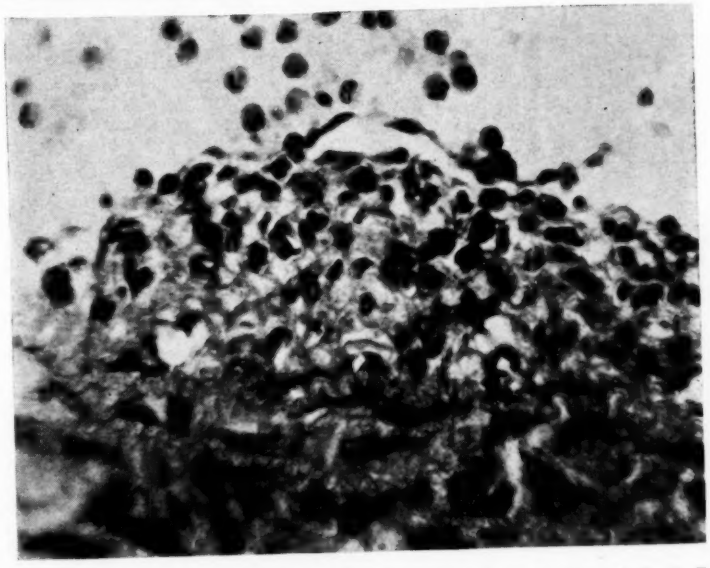

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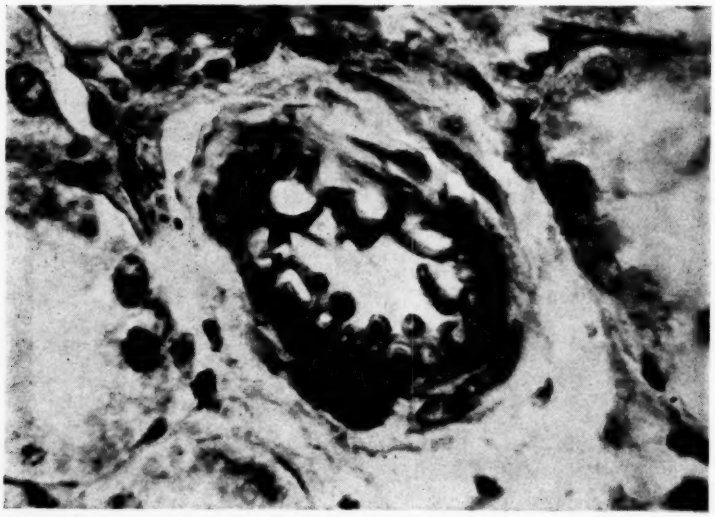
FIG. 1. Aorta; 30 seconds after intraarterial injection of 55 mg. of a fine suspension of cholesterol (21 mg. per Kg. body weight); X 800. Note radial position of smooth muscle cells and their penetration through the internal elastica into the recent intimal-subintimal cushion. (Compare with illustration in Altschul, R.: Experimental arteriosclerosis in the nervous system. *J. Neuropath. & Exper. Neurol., 5:* 333-341, 1946).

FIG. 2. Pulmonary artery; diameter 3,060 μ; 30 seconds after intravenous injection of 200 mg. of a fine suspension of cholesterol (76.8 mg. per Kg. body weight); X 800.

ANATOMIC ALTERATIONS OBSERVED ON THE BLOOD VESSELS OF RABBITS INJECTED INTRAVASCULARLY WITH CHOLESTEROL SOLS OR WITH A COLLOIDAL SUSPENSION OF SODIUM STEARATE AND SACRIFICED AT VARYING INTERVALS AFTER INJECTION.



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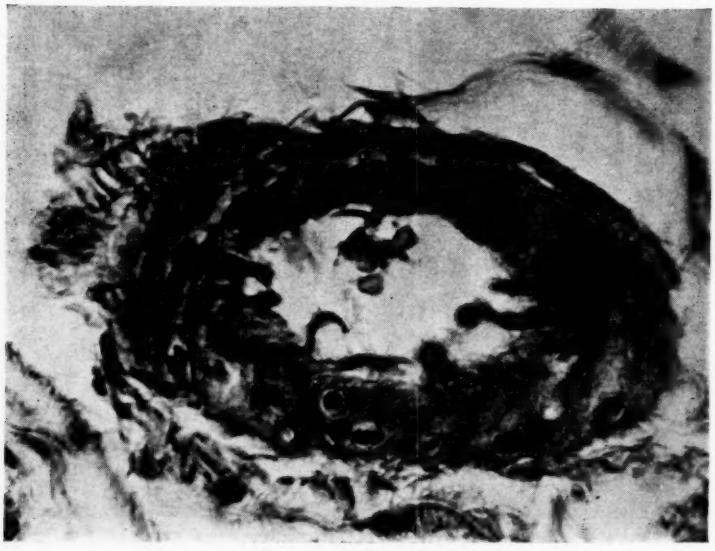

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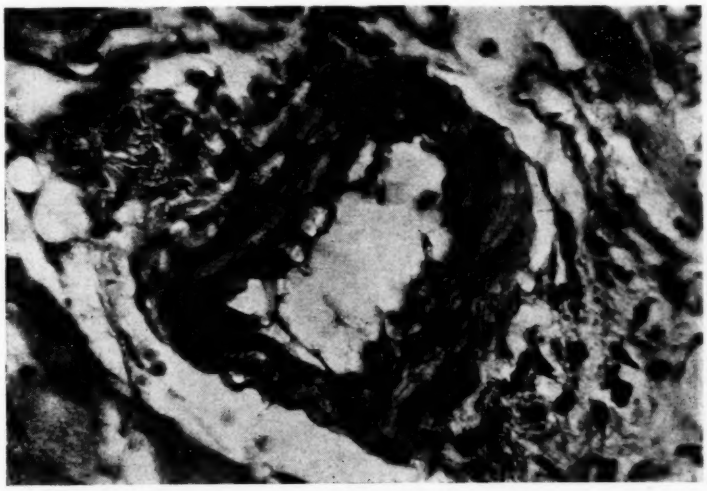
FIG. 3. Renal artery; diameter 80 μ; 20 minutes after intravenous injection of 62 mg. of a fine suspension of cholesterol (24 mg. per Kg. body weight); X 1,000.

FIG. 4. Pericardicophrenic artery; diameter 230 μ; 5 minutes after intravenous injection of 134 mg. of a fine suspension of cholesterol (53.6 mg. per Kg. body weight); X 1,000.

ANATOMIC ALTERATIONS OBSERVED ON THE BLOOD VESSELS OF RABBITS INJECTED INTRAVASCULARLY WITH CHOLESTEROL SOLS OR WITH A COLLOIDAL SUSPENSION OF SODIUM STEARATE AND SACRIFICED AT VARYING INTERVALS AFTER INJECTION.



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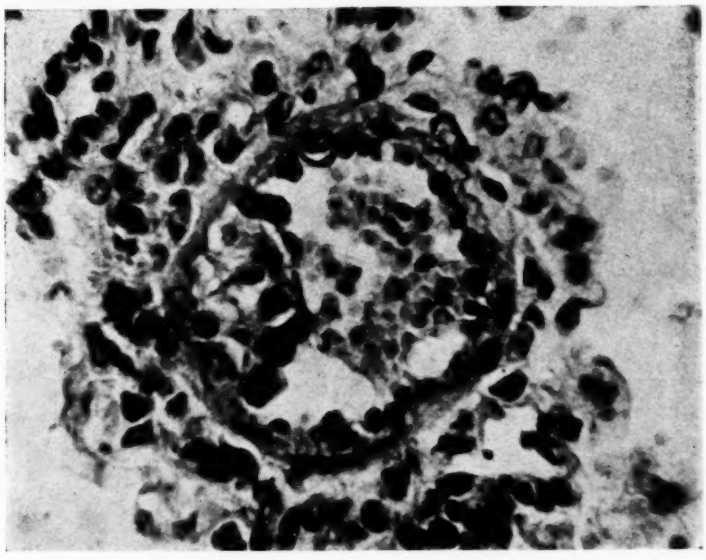

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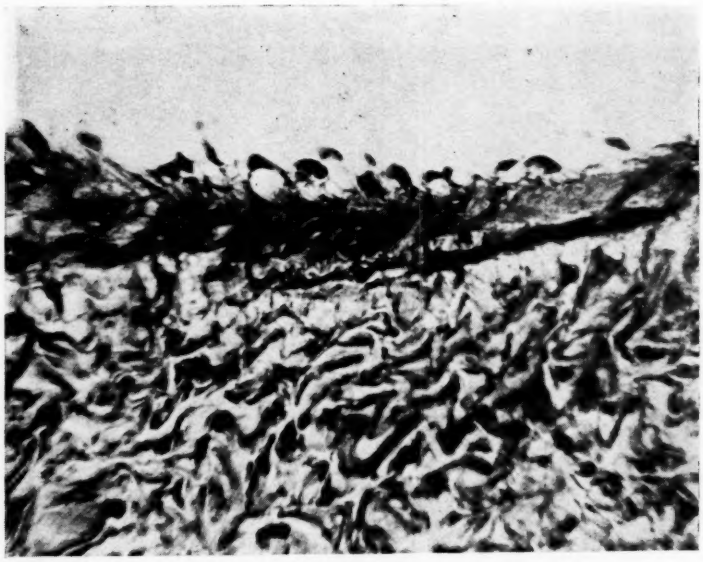
FIG. 5. Coronary artery; diameter 180 μ; 1 minute after the second injection of 43 mg. of a fine suspension of cholesterol which followed 24 hours after the first such injection of 43 mg.; total dose injected, 86 mg. (41 mg. per Kg. body weight); X 700.

FIG. 6. Pulmonary artery; diameter 140 μ; 7 days after second injection of 54 mg. of a fine suspension of cholesterol which followed 24 hours after the first injection of 54 mg.; first injection made intravenously, second one intracardially; total dose injected, 108 mg. (32.7 mg. per Kg. body weight); X 700.

ANATOMIC ALTERATIONS OBSERVED ON THE BLOOD VESSELS OF RABBITS INJECTED INTRAVASCULARLY WITH CHOLESTEROL SOLS OR WITH A COLLOIDAL SUSPENSION OF SODIUM STEARATE AND SACRIFICED AT VARYING INTERVALS AFTER INJECTION.



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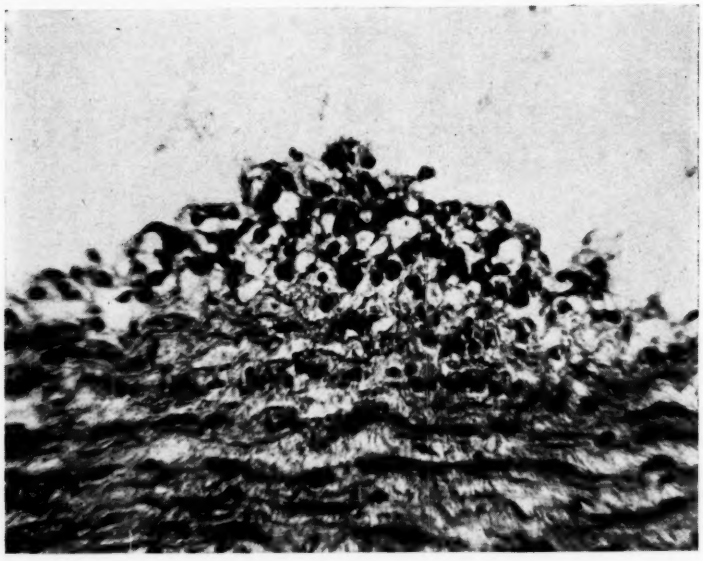

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FIG. 7. Vena cava inferior; 1 minute after intracardial injection of a coarse suspension of cholesterol (68.2 mg. per Kg. body weight); X 500.

FIG. 8. Aorta; 30 minutes after intravenous injection of 80 mg. of a coarse suspension of cholesterol (31 mg. per Kg. body weight); X 700. (Compare with illustration in Hueper, W. C. Arteriosclerosis. The Anoxemia Theory. *Arch. Path., 39:* 117-131, 1939).

ANATOMIC ALTERATIONS OBSERVED ON THE BLOOD VESSELS OF RABBITS INJECTED INTRAVASCULARLY WITH CHOLESTEROL SOLS OR WITH A COLLOIDAL SUSPENSION OF SODIUM STEARATE AND SACRIFICED AT VARYING INTERVALS AFTER INJECTIONS.

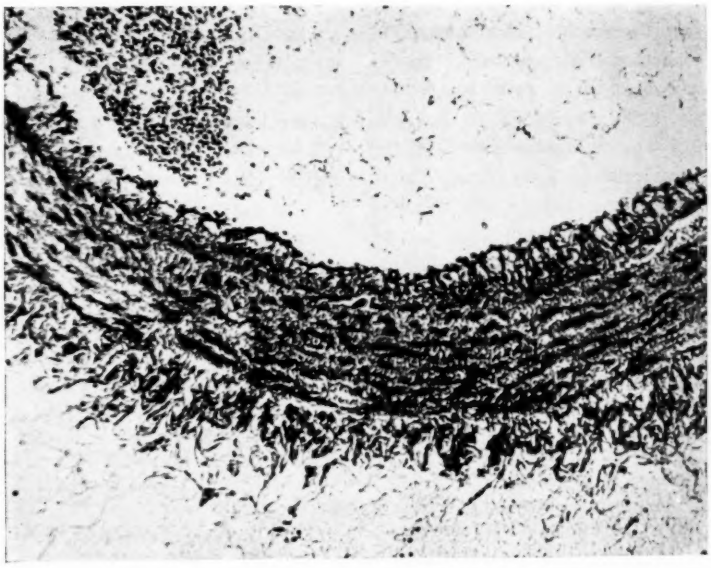

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FIG. 9. Pulmonary artery; diameter 600 μ; 30 minutes after intravenous injection of 100 mg. of a fine suspension of sodium stearate (32.3 mg. per Kg. body weight); X 600.

FIG. 10. Pulmonary artery; diameter 4,000 μ; 30 seconds after intravenous injection of 100 mg. of a fine suspension of sodium stearate (28 mg. per Kg. body weight); X 1,000.

injection. Organization of subintimal lesions began after thirty minutes. Such observations were correlated with blood chemical findings which revealed a drop in blood cholesterol after injection corresponding to the period of primary deposition in the vessels and a subsequent rise in blood cholesterol corresponding to the phase of resorption of the primary deposit and transportation of cholesterol to the viscera. Cholesterol was commonly found in the reticulo-endothelial cells of liver ten to thirty minutes after injection. Where the colloidal particles were so small that one could, for all practical purposes, speak of a "true solution" of cholesterol the blood vessels were not damaged. In animals injected with such material steatosis of the liver developed within three minutes after injection. The same phenomenon was observed after injection of olive oil or other fats in fine dispersion.

Summary

1. The literature referring to anatomic alterations induced by intravascular injection of cholesterol suspensions has been reviewed.

2. Observations made on 100 rabbits injected intravascularly with 3 cholesterol sols of varying dispersion, with colloidal graphite, or with sodium stearate are reported.

3. Intravascular injection of colloidal material into rabbits resulted in immediate vascular damage in the vessels nearest to the site of injection.

4. Vascular alterations initiated by intravascular injection of colloid suspensions resemble atherosclerotic lesions commonly encountered after feeding of cholesterol to animals but differ from them in so far as they develop without preceding hypercholesteremia.

5. Analysis of various experiments leads to the suggestion that atherosclerosis induced by intravascular injections of colloid suspensions is the result of precipitation of micels upon the vascular intima, that the initial alterations are reversible, and that the foreign material is transported from the primary deposit in the subintima to a secondary deposit in the reticulo-endothelial cells of the liver and other viscera. Other experiments indicate cummulative effect of multiple insults within a short time interval and rapid organization of unresorbed vascular lesions.

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Acknowledgement is made to Mrs. Marie Evans and Mrs. Beryl Murray for the preparation of tissue sections.

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The Antibody Response in Old Age

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Very little is known about the antibody response in old age. Most of the published data concerning immunity in the aged is based on a comparison of the very young to the adult organism, and furthermore most of the experimental work has been done on animals. This has been pointed out by Duran-Reynals (8) in his excellent review of this subject. It was therefore deemed important to study the antibody-producing ability of the elderly patient. In the course of our investigation at the Philadelphia General Hospital on nutritional factors in relation to antibody production, we determined the response to typhoid immunization in the aged.

Material and Methods

A series of 37 patients ranging from 15 to 78 years of age were selected. They presented laboratory signs of hypoproteinemia, the serum albumin levels being below 4.1 gm. per 100 cc. (normal albumin values in our laboratory are 4.90 to 6.30 gm. per cent); in addition they presented clinical evidence of recent weight loss, avitaminosis, and anemia. About half of these patients were given protein supplements in the form of meat averaging 40 to 70 gm. per day in addition to a hospital diet of 2000 to 2500 calories containing 1 gm. of protein per kg. of body weight. The diets were maintained isocaloric by reducing their fat and carbohydrate allowances. The patients presented a variety of clinical diagnoses, such as diabetes mellitus with complications of this disease, leg ulcer, and chronic malnutrition.

All patients were given three immunizing injections, subcutaneously, of typhoid vaccine containing 500 million bacteria per cc. (0.2 or 0.5 cc.) at intervals of seven or ten days. Blood protein fractions were determined weekly by methods previously described (19). Hemoglobin was determined by the photocolorime-

Table 1. A Comparison of the Data of Patients Above and Below Age 65.

	15-65 Years		66-78 Years	
	Mean	S. D.	Mean	S. D.
Number of Patients	23		14	
Mean Age	49.6		70	
Mean Typhoid Antibody Titre	1:1981	1:2432	1:3209	1:3985
Mean Total Protein (Gm. %)	7.52	.92	7.32	.65
Mean Globulin (Gm. %)	3.58	.76	3.25	.61
Mean Albumin (Gm. %)	3.94	.54	4.07	.31
Mean Gamma Globulin (Gm. %)	2.24	.83	1.78	.38
Mean Hemoglobin (Gm. %)	11.9	1.82	12.6	1.77
% Diabetics	35%		57%	
% Supplemented	48%		50%	

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Dr. Wohl is Associate Professor of Medicine at Temple University Medical School and is Chairman of the Commission on Nutrition of the Pennsylvania State Medical Society. He graduated from the Med-Chi College in 1912 and did post-graduate work at the University of Berlin in 1913, Columbia in 1923, and the University of Vienna in 1927 and 1928.

tric method using 0.4 per cent ammonium hydroxide solution (10). Typhoid agglutinin titres were estimated weekly using typhoid "H" antigen in the standard Widal reaction.

Results

The patients were divided into two groups at age 65. Table 1 shows a comparison of the arithmetic means of the various blood protein fractions. The mean ages of the two groups was 49 and 70 years, respectively. Statistical analysis of these components by means of the Fisher "t" test shows that there is no significant difference between the two groups in any of the protein components. It would seem, therefore, that in this respect these two groups are comparable, and it may be assumed that any difference in the titre is not caused by the serum protein levels of the patients.

The antibody titres reveal that in the younger group the mean titre was 1:1981 and in the older 1:3029. The difference between these two groups is less than 1 tube's reading, which is well within the laboratory error for the procedure. Furthermore, statistical analysis reveals this difference not to be significant.

The supplemented patients comprise 48 per cent of the younger group and 50 per cent of the older group. Therefore any effect which

Table 2. Mean Typhoid Antibody Titre Divided by Decades.

Age	Number of Patients	Mean Age	Mean Titre
15-50	8	33.4	1:1515
50-60	8	54.5	1:2620
60-70	14	65.5	1:2583
70-78	7	73.4	1:2674

Table 3. Mean Typhoid Antibody Titres Observed in Supplemented and Non-supplemented Groups.

Age	Supplemented			Non-supplemented		
	Number of Patients	Average Age	Mean Typhoid Titre	Number of Patients	Average Age	Mean Typhoid Titre
Over 65	7	68.7	1:891	7	71.3	1:5166
Under 65	11	45.5	1:1604	12	53.3	1:2327

supplementation may have had is balanced by the equality of the distribution.

Table 2 shows the mean antibody titres analyzed according to decades of age. It is evident that the lowest titre is in the youngest group and the highest is in the oldest group. Here again the difference is less than 1 tube's reading; hence no significant difference is found.

Discussion

It is generally accepted that adult animals are able to respond to antigenic stimuli better than the very young. As early as 1897 Metchnikoff (cited in Morgan, 14), showed that larger animals were able to produce antibodies to tetanus toxin in larger quantities than were smaller ones. The ability of adult animals to produce higher antibody titres than young animals was found by Freund (9) for *Eberthella typhosa,* sheep erythrocytes, horse serum, and egg white; for Eastern Equine Encephalomyelitis virus by Morgan (12, 13, 14), rabies virus by Casals (2, 3), and Casals-Ariet and Webster (4), and increased resistance to Vesicular Stomatitis virus was demonstrated by Sabin and Olitzsky (15, 16, 17, 18). These data are concerned with antibody response in newly born infant animals as compared to the adult but not with the truly senescent animal.

Kolodny (11), however, using *Trypanosoma cruzi,* which is pathogenic for mice, showed that these animals developed their ability to respond to the stimulus at 30 days of age and retained their capacity to produce adequate levels of antibody throughout senescence as well as through adulthood. To our knowledge no studies are reported in the literature on antibody response of the senescent human.

It is generally believed, though poorly substantiated, that aged people are more susceptible to infection than middle-aged adults. It is certainly true that terminal infection is quite common among the elderly patients.

However, it is clinical experience that aged persons react to systemic infections, such as pneumonia, with much milder signs and symptoms than middle-aged adults. To illustrate, the physiologic response to stress in the aged, such as, temperature, pulse, respiration, leukocytosis, and general appearance is often mild, if altered at all, in the presence of an infection, while in the younger person such stress leads to severe physiologic disturbances. Since these responses seem feebler in the old person one might expect that his antibody production, another physiologic process, might also be feebler.

Duca (7), and Culbertson and Kessler (6) reported that nursling mice were very susceptible to doses of *Trypanosoma lewisi,* produced little or no antibody titre, and showed no leucocyte or monocyte response to the injection. In contrast, middle-aged animals were resistant and developed a marked leucocytosis. Our results tend to show, however, that there is no difference in antibody production as a result of the aging process, although it does effect other responses.

The reticulo-endothelial system is intimately involved in antibody production. Culbertson (5) has shown that the reticulo-endothelial system of the older animal is more active than that of the younger in phagocytizing intraperitoneally injected trypan blue. Furthermore Morgan (14) has demonstrated that the blood of older animals is cleared more quickly of injected virus, a reaction almost as rapid as that of a previously immunized younger animal. Thus as the reticulo-endothelial system matures it is better able to function adequately.

Since the reticulo-endothelial system functions adequately in the aged and since aging per se is not a factor in antibody production of clinically similar patients one may assume that susceptibility of infection of the older patient might be caused by a hormonal, nutritional, or other metabolic factors. Additional work must be done to clarify these points.

Summary

The antibody responses to typhoid vaccine was determined in 37 chronically malnourished patients ranging in age from 15 to 78 years.

Under the conditions of our experiment aging had no effect on the production of antibodies.

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The authors wish to thank Miss Kathleen Bayer, who performed the determinations described, and Mrs. Barbara Sigmond, who did the statistical analyses.

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Suicide and Attempted Suicide Among Old People

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APPARENTLY suicide occurs rather seldom among the aged, but a statistical compilation shows that the frequency of suicide (per 100,000 inhabitants of the same age and sex) rises with increasing age. The statistics of the Danish Health Authorities run parallel with this; during the year 1948 the frequency of suicide at the age of 65 years or more was 51.1 for men and 22.9 for women, whereas the corresponding figures for individuals 10 to 64 years old was 38.9 for men and 21.9 for women.

Looking at the variation of the frequency of suicide during a series of years, a certain difference between the elder and the younger age groups is noticeable. In Germany the frequency of suicides among men over 70 years was found to increase during the period 1911 to 1923, whereas the decrease in the frequency of suicides among the younger age groups was observed in Germany as well as elsewhere during the war period (3).

The reasons for suicide are also different in the two age groups. Physical infirmity, mental deficiency, economic problems, anxiety about the future, and loneliness are reported in the literature as the most frequent causes for suicide among the aged; but senile mental disorders, especially the melancholia, also play an important role (4).

In the younger age groups the main cause is affect explosion in apparently healthy persons and mental depression during the course of manic depressive psychosis.

Material

To throw light on the problem of suicide among aged people, the case histories of patients from De Gamles By in Copenhagen who have left or died in the period 1939 to 1948 have been reviewed. From the total of 7,200 patients in this group all cases of completed suicide, 14, as well as the most serious attempts at suicide, 21, were selected. Of the 35 cases of completed and attempted suicide, 4 persons were between 60 and 64 years old, 10 between 65 and 74, and 21 were 75 years or older.

The completed suicides were all found among the men, and 11 of these occurred among those in the wards for ambulatory patients. Two patients had lived in De Gamles By for nine months, 7 for more than three years, and 5 for more than ten years.

There were 21 attempted suicides, 11 men and 10 women, all of whom, with the exception of one man and one woman, were patients in the hospital ward. All 21 patients had been hospitalized in De Gamles By for three to ten years.

Motives and Methods for Suicide

Accomplished Suicides.—The *motives* for accomplished suicide in the 14 cases may be listed as follows (5 of the patients had threatened to commit suicide before the completed attempt):

1. Physical Discomfort.—Five patients suffered from recurrent acute pains and one from Huntington's Chorea.

2. Mental Changes.—Four patients suffered from states of depression apparently caused by physical discomfort; one patient feared becoming paralyzed. Five other patients had previously suffered from mental depression and one individual in this group had presented signs of frank manic-depressive psychosis. Two of the individuals apparently acted under the influence of a mental trauma; one of these patients, a man of 79, had just previously been arrested for obscenity and the other, aged 78, had quarrelled with his wife.

It should be noted that none of the patients showed signs of obvious dementia.

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3. Alcoholism.—Five patients were chronic alcoholics.

4. Syphilis.—Of the 14 patients, 6 suffered from syphilis; the Wassermann reaction in 4 of these 6 cases was positive or questionably positive.

The *methods* employed in the cases of completed suicide were as follows: 12 patients used violent methods, primarily hanging, strangulation, and precipitation, one took gas, and only one took drugs.

Attempted Suicides.—The *motives* for attempted suicide differed somewhat from those for completed suicide. All 21 patients who attempted suicide were more physically and mentally disabled than those who died; 19 were in the hospital.

1. Physical Discomfort.—Six patients had just recovered from acute illness (diarrhea, fever, or local inflammation) or were exhausted by some chronic disease. Four patients suffered from violent recurrent pains.

2. Mental Changes.—Twelve patients presented signs of mental depression (5 of these also suffered from severe physical ailments); 11 patients showed symptoms of dementia.

3. Alcoholism.—Alcoholism was not a factor in this group.

4. Syphilis.—Five of the 11 men had had syphilis and 2 still showed a positive Wassermann reaction. Only one of the women had had syphilis.

While in no case was the attempt at suicide of such a character that it might have shortened the patient's life, 2 survived only up to five days, 2 up to ten days, and 4 for three to six weeks after the attempt, thus indicating that their general state of health in many instances was poor.

The *methods* employed in the cases of attempted suicide: all 21 patients used violent methods, especially strangulation and precipitation.

Discussion

Although many old people regard an institution such as De Gamles By as a very unattractive place to spend their last years, institutionalization was a concurrent cause of suicide in only one instance in the group of 35 cases (a rather senile man of 64 who hanged himself after writing a bitter letter of farewell to a daughter who refused to lodge him). The fact that suicide as a rule is committed rather a long time after admission to De Gamles By also indicates that institutionalization is rarely a factor. Experience shows that the greater number of inmates soon feel at home, to a certain extent losing contact with the surrounding world and enjoying the economic security which the institution offers them (7).

Whether or not syphilis is of any consequence as a motive for suicide cannot be ascertained by means of the present material. Although 11 of the 25 men had a positive or questionably positive Wassermann reaction or a previous history of syphilis, other investigations on suicides among all age groups do not show a corresponding predominance of syphilis as a factor (2, 5). However, fear of general paresis or depression caused by a developing general paresis may be a motive for suicide; in the present material gastric syphilitic pains were the motive for one or two cases.

Alcoholism was found to play the same important role as a cause for suicide as among younger individuals.

The great number of symptoms and signs of mental depression is not surprising since periods of depression among the aged are very frequent.

Of the group of 35 patients only 2 were mentally normal. Both of these committed

suicide in an affect explosion. This is a very small number considering that such explosions are regarded as the most common cause of suicide among the younger age groups and that the possibility of frictions and dissatisfactions is great among people in an asylum. The reduced level of emotion characteristic of old age may account for the small number in this category.

Of the specific mental symptoms frequently considered associated with suicidal attempts, aggression is particularly emphasized by psychoanalysts (6). However, in the material investigated here there were only 3 patients who showed signs of animosity to the surroundings (wife or children).

The wish for reunion with the beloved dead has also been mentioned by psychoanalysts as a motive for suicide (1). The following report will possibly illustrate this, although it is doubtful whether it may be appropriate to the theory:

> A widow, 75 years old, who was demented, confused, and restless, but who had not previously suffered from hallucinations, threatened suicide. Shortly thereafter she attempted to jump out of the window, saying that she wanted to go home to her parents.

If the wish of reunion really was her motive this is, at any rate, remarkable in a person so mentally deteriorated.

In the group of demented patients who attempted suicide it would seem to be rather the debilitated condition caused by the somatic signs which led to attempted suicide than the inconveniences directly associated with such signs. In this connection it should be borne in mind that during recent years English and American investigators have accentuated the dependence of senile dementia on somatic sufferings, for instance infections and avitaminosis. Shock (9) gave a clear survey of this problem and a recent investigation was made by Kiørboe and Vinther-Paulsen (8).

That old people seem to prefer violent methods of committing suicide is confirmed by the present investigation. The reason for the choice of violent methods rather than the use of drugs is probably the lack of sufficient energy and ingenuity to obtain poisons. It should be noted that the patients in the ambulatory wards had access to barbiturates to the same extent as persons outside the institution. The dementia may, however, also be of importance in the choice.

Summary

A study of the records of the 35 old people who committed or attempted suicide among the total of 7200 residents of De Gamles By during the period 1939 to 1948 has revealed the following points:

1. that somatic inconveniences, particularly pains accompanied by depression, are the most frequent causes of suicide; affect explosions in mentally healthy persons are rare as a cause of suicide in this group,
2. that a debilitated constitution may aggravate an existing dementia and provoke an attempt at suicide, which is seldom successful because of mental and physical weakness,
3. that suicide is not provoked by the special circumstance of institutionalization,
4. that syphilis, either past or present, is remarkably frequent among the men who committed or attempted suicide,
5. that alcoholism is as important a factor of motivation for suicide in the aged as it is in younger individuals,
6. that old people almost entirely make use of violent or active methods, and
7. that matrimonial conflicts, economic insecurity, and loneliness are rare as motives for suicide among this selected group of individuals.

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Inter-Regional Migration of the Aged in the United States

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It is common knowledge that there is a significant migration of the aged to the Pacific coast states and to Florida, but few if any attempts have been made to analyze this movement. While data for a complete study are not available, Bureau of the Census tabulations of division of residence in 1940 by division of residence in 1935 (1) are sufficient for an analysis of gross inter-regional movements of persons 65 years of age or over. Although the Census Bureau refers to its nine-area breakdown of the United States as divisions and to its four-area breakdown as regions, the present study, which is based on tabulations for the nine-areas, will refer to these areas as regions since the latter term is more familiar.

One of these regions, the Pacific, is composed of the states of California, Oregon, and Washington. Each of these has a net in-migration of aged persons, and although California predominates, the tabulations for this region are quite satisfactory for present purposes. Unfortunately, the situation is not so simple with reference to the migration of the aged to Florida. This state is included in the South Atlantic region which includes seven states in addition. While there are obvious shortcomings to the procedure, it has been necessary to analyze the movement of aged persons into the entire region rather than into Florida itself. This is not satisfactory by any means, but the justification for so doing is that

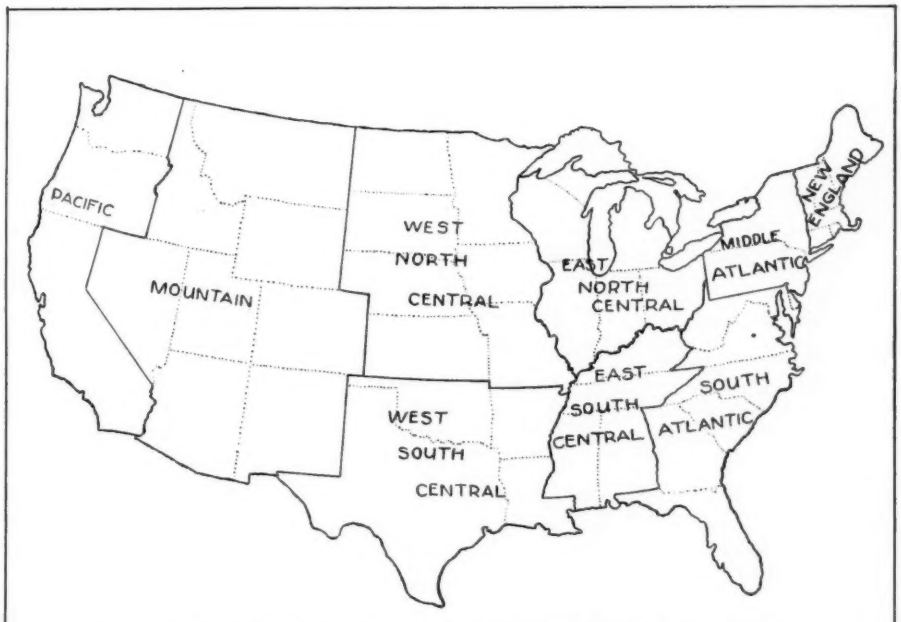

Fig. 1 Regional Delineation For Study of Inter-Regional Migration of the Aged.

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Florida alone accounts for about 95 per cent of net and well over half of all in-migration into the region(1).

It is probable that some of the northern states of the region such as Maryland and Virginia share to a significant extent in the movement from the New England and Middle Atlantic regions, but it is also probable that given the statistical importance of Florida in the region's in-migration, the available data yield a fairly good index of the sources of movement into that state. It must be emphasized, however, that the percentages given are percentages of the migration of the aged into the region and not into Florida alone.

Obviously the available data can be treated in two ways: either in terms of the sources of the in-migrants resident in a given region in 1940, or else in terms of the destination of the out-migrants who were resident in a given region in 1935. The first of these possibilities has been used for an analysis of in-migration into the South Atlantic and Pacific regions, and the second for a general analysis of aged out-migration. It may be worth while to repeat that the reason for limiting the problem of in-migration to the two regions mentioned is that they alone account for practically all of the net in-migration of the aged in the United States.

Sources of In-Migrants to Pacific and South Atlantic Regions

The results of the first phase of the study are summarized in table 1. In addition to what has already been said concerning the major directions of the migration of the aged, the observation can be made that in general terms migration to the Pacific region comes in large part from west of the Mississippi while most of that to the South Atlantic comes from east of the Mississippi. This statement is more descriptive of the situation in the latter region than in the former.

The South Atlantic region draws only about 13 per cent of its total in-migration of aged persons from the four regions west of the Mississippi while the Pacific region draws approximately 40 per cent of its aged in-migrants

Table 1. Source of Aged Migrants (65 Years and Over) to South Atlantic and Pacific Regions, 1935-1940, by Region of Residence in 1935 and by Sex.

Destination and Sex	Percentage Distribution of Migrants According to Source								
	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Pacific Region									
Total	2.9	10.1	21.4	32.4	3.3	1.7	10.3	17.8	....
Male	2.3	9.3	19.7	33.1	3.2	1.5	11.4	19.5	....
Female	3.4	10.8	22.9	31.8	3.5	1.9	9.4	16.3	....
South Atlantic Region									
Total	10.4	38.1	26.6	5.5	....	12.3	2.9	1.1	3.1
Male	10.0	38.1	27.7	5.3	....	12.1	2.9	1.1	2.8
Female	10.7	38.0	25.7	5.6	....	12.5	2.9	1.1	3.4

from the five regions east of the Mississippi. The difference here is undoubtedly associated with the fact that there is a general trend of migration of all age groups to the far west while migration into the South Atlantic is much more selective.

If the regional sources of the migration are examined, it is found that the Middle Atlantic region, composed of the heavily populated states of New York, Pennsylvania, and New Jersey, contributes well over one-third of all of the aged migrants to the South Atlantic region. There is certainly a selective factor of some sort at work here since these three states contain nothing like a third of the aged population outside of the South Atlantic states. The East North Central region contributes the next largest group of aged migrants, about one-fourth of the total. The New England and East South Central regions each contribute a little over 10 per cent of the total while, as was pointed out in the foregoing paragraph, the various western regions make only very minor contributions.

Turning to the in-migration to the Pacific region, it will be noted that the seven West North Central states are the greatest single source of aged migrants to the west coast, the amount being just under one-third of the total number of aged persons who migrated into the region. The East North Central ranks second in percentage as a source of migrants to the Pacific region although the percentage it contributes is slightly lower than that contributed to the South Atlantic. The Mountain States, although sparsely populated, rank third. Here the factor of geographical proximity is no doubt crucial as it is in the case of the third ranking regional source of the South Atlantic's aged in-migrants, the East South Central. The Middle Atlantic and West South Central states each produce about 10 per cent of the Pacific region's in-migrants while the New England, South Atlantic, and East South Central regions taken together produce less than 10 per cent.

Although it cannot be proved with the data presently available, the differentials which have just been described suggest that the character of aged in-migration into the South Atlantic and the Pacific regions may be quite different in some respects. Knowing something of the general nature of the distribution of the aged population in the various regions, it seems reasonable to hypothesize that aged in-migration into the South Atlantic region is predominantly from urban sources while that into the Pacific region is to a much greater degree, and possibly is predominantly, from rural sources. If this should prove to be true, some excellent possibilities for research on old age adjustment are offered.

Destinations of Out-Migrants

Table 2, which summarizes the destinations of aged out-migrants from the nine regions, shows in another way what was said in the preceding section. That is, the Pacific region shows a relatively high percentage of migrants from each region. It is the chief destination of the aged migrants from the East North Central, and particularly the West North Central and Mountain regions. The South Atlantic region on the other hand is the chief destination of migrants from the Middle Atlantic and East South Central regions, while the proportion of East North Central aged migrants that it draws is only slightly less than that of the Pacific region.

When analyzed in terms of the destinations of their aged out-migrants, the various regions show some interesting characteristics which have not been touched on thus far. New England, as might be expected, sends the largest single group of its aged migrants, 40 per cent, to the contiguous Middle Atlantic region, but it also sends a group almost as large, 34 per cent, to the South Atlantic. The only other region to which it sends a fairly significant number of its aged migrants is the Pacific.

When considered in terms of out-migration, aged persons from the South Atlantic region have as their chief destination the Middle Atlantic region followed by the East North Cen-

TABLE 2. REGION OF RESIDENCE OF TOTAL AND AGED MIGRANTS (65 YEARS AND OVER) IN 1940 BY REGION OF RESIDENCE IN 1935

Region of Residence 1935	Region of Residence in 1940								
	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
New England									
Total	....	50.5	10.5	2.1	20.6	1.5	2.0	1.7	11.1
Aged	....	40.1	7.4	1.4	33.7	1.2	1.4	1.5	13.4
Middle Atlantic									
Total	18.0	....	22.6	2.8	35.2	2.2	3.1	2.1	14.0
Aged	15.9	....	16.5	2.7	42.7	1.7	2.3	2.0	16.2
East North Central									
Total	2.8	17.4	....	19.3	17.1	9.4	6.4	5.1	22.5
Aged	2.2	11.8	....	16.3	24.4	6.9	5.9	4.2	28.1
West North Central									
Total	0.6	2.7	22.9	....	3.7	2.1	11.5	17.0	39.5
Aged	0.7	2.8	20.0	....	5.2	2.2	12.0	12.8	44.2
South Atlantic									
Total	4.6	35.1	20.4	2.8	....	20.3	6.3	2.0	8.5
Aged	7.2	31.8	21.2	4.1	....	16.9	6.3	1.8	10.7
East South Central									
Total	0.7	4.1	32.0	5.3	35.0	....	16.3	1.8	4.7
Aged	0.6	3.5	28.7	5.8	32.3	....	21.1	1.6	6.4
West South Central									
Total	0.4	2.4	10.8	15.5	5.3	9.6	....	18.6	37.4
Aged	0.6	2.2	8.8	32.5	5.5	11.0	....	11.5	27.9
Mountain									
Total	0.5	2.2	6.2	12.4	2.6	1.1	12.5	....	62.3
Aged	0.7	2.7	6.9	13.4	2.7	1.1	10.3	....	62.3
Pacific									
Total	3.5	11.1	14.3	12.3	11.2	2.3	11.7	33.5	....
Aged	4.0	12.0	19.2	19.3	9.2	2.1	9.3	25.0	....

tral. There can be little doubt that this represents to a great degree the influence of aged Negro out-migration. In this connection it is interesting to note that the East North Central region is one of the major destinations of aged out-migrants from the East South Central states. From this and the fact mentioned just previously, it would seem fair to infer that the out-migration of aged Negroes from the South has followed the same lines as that of the total Negro migration. It has been demonstrated for the latter that Negroes from the coastal states have tended to move up the Atlantic seaboard while those from the interior states have tended to migrate into the Midwest (2).

Migration of the aged from the West South Central region shows one unexpected characteristic. The chief destination is the West North Central division. Inasmuch as both of these regions are strongly rural in character, it would seem that the migration is in great part a rural-to-rural movement. What makes this most surprising is the fact that the West North Central region is itself the area of highest out-migration of the aged. The explanation for the relation between the two West Central regions is probably to be found in their geographic contiguity.

The two most western regions deserve brief comment. The striking, but not surprising,

characteristic of the Mountain states is that the destination of almost two-thirds of their aged migrants is the Pacific region. This is the largest percentage to be found in any of the inter-regional movements. The other side of the picture is, of course, the fact that none of the remaining regions draw many migrants from this area. Out-migration from the Pacific coast practically reverses this: no one region dominates as a destination.

It is interesting to note that the destinations of out-migrants from the Pacific region correlate closely with the sources of its in-migration. The Mountain, East and West North Central regions are the largest contributors of aged migrants to and also the largest recipients from the Pacific region. The East South Central and New England regions contribute the fewest and receive the fewest. This suggests that much of the aged out-migration from the west coast may be by persons who were in-migrants to that area at an earlier time. In other words a large part of this out-migration may be by "returnees." This cannot be proved or disproved with presently available data.

Two points may be made concerning differences between these patterns of migration of the aged and the patterns for all migrants. Perhaps the most striking difference is that exhibited in the South Atlantic region. Considered again in terms of in-migration, it may be noted that every region except one, the East South Central, contributes a higher proportion of its aged than of its total migrants to this division. A somewhat similar situation exists with respect to the Pacific region except that there are two regions, the West South Central and the Mountain, which do not fall into the pattern. This is simply another way of emphasizing the tremendous attraction of Florida and the west coast states for the aged migrant. The general effect with respect to other regions is that the proportion of aged migrants is lower than that of total migrants, although some exceptions can be noted.

One such exception which may be mentioned briefly concerns the importance of migration by the aged between predominantly rural areas. In-migration to the West North Central region is a case in point. The proportion of aged in-migrants is higher than the proportion of all migrants from the predominantly rural South Atlantic, East South Central, Mountain, and West South Central regions. It is particularly striking for the latter, the proportion of aged migrants being more than twice the proportion of all migrants.

On the other hand in-migration from the more urbanized regions to the West North Central shows a higher proportion of total than of aged migrants. The situation is similar for the West South Central region to which the rural West North Central and East South Central regions contribute higher proportions of aged than of total migrants and to which the more urbanized regions contribute in the opposite way. It should be emphasized that the point under discussion is more than the fact that rural areas have more old people than do urban areas; it is rather the possibility of a fundamental difference in the migratory patterns of young and aged persons coming from the same area. It suggests that the movement of aged persons is a rural-to-rural movement far more often than is the movement of younger persons.

Summary

An analysis of available data from the Sixteenth Census of the United States bearing on the inter-regional migration of aged persons has been made.

While bearing out the common assumption that the Pacific coast states and Florida (South Atlantic region) are the most frequent destinations for such migrants, the analysis shows that the vast majority of aged migrants into the latter region come from areas east of the Mississippi and that although a slight majority of aged migrants to the Pacific coast come from west of the Mississippi, this region draws significant numbers of aged persons from practically every other region in the nation.

The Pacific coast states are the chief destination of aged migrants from the Mountain, West North Central, and East North Central regions while the South Atlantic region is the chief destination of migrants from the Middle Atlantic and East South Central states. The largest percentage of aged migrants from New England go to the Middle Atlantic states, and the largest proportion from the West South Central region go to the West North Central. Apparently geographic contiguity is an important factor in both cases.

Destinations of aged migrants from the Pacific region parallel the sources of its aged in-migrants.

The data also suggest that a larger proportion of the migration to Florida may be from urban sources than is the case with the migration to the Pacific coast and that the migration of aged persons is more likely to be rural-to-rural than is that of the total population.

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Professors in Retirement

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How do professors retire? How do they busy themselves in the retirement years? Do they undertake new ventures in living experience or do they live in the past? Is retirement for them an "aching void" or does it bring new satisfactions which equal or surpass those of the teaching years? The present study seeks an answer to some of these questions.

Methods

With the assistance of the Teachers Insurance and Annuity Association some 1000 cards were sent in February, 1946, to those receiving annuity checks from that association. These cards were enclosed with the monthly checks and included a statement from the T.I.A.A. relative to the projected study. Also included was a self-addressed form card on which the annuitant could indicate his willingness to assist in this study.

Of the 1000 so solicited 482 indicated their willingness to help. A letter and questionnaire were then sent to each of these and usable returns were received from 359. Death within this brief interval accounted for the failure of a few. Several others discovered upon receipt of the questionnaire that they were outside the group to be studied and a number without doubt never set themselves to the task.

In the analyses which follow, frequently a number less than 359 is reported on. Some of the analyses were made on the first 300 returns before straggling reports were received, and on certain items not all reports were usable because of limited or omitted responses. Retirants from forty-two states were included in the study.

It should be recognized that since responses to the announcement and to the later questionnaire were voluntary from the 1000 originally canvassed, the 359 whose reports provide the basis for this study do not represent a controlled sample. We would not be justified in assuming that the particular ratios found for this group are the ratios which would be present among all retired professors or even all professors insured with T.I.A.A. This research task was conceived as a pilot study to reveal range and variety of reactions to retirement. Even without the degree of control which we may desire in later studies, pilot studies such as this may furnish the general picture regarding retirement behavior.

Initially in this study an analysis was made of all the records to determine the degree of satisfaction to retirement. Five seminar students, working independently, listed the retirant as S (satisfied), D (dissatisfied), or U (uncertain, with some combination of satisfaction and dissatisfaction). The five separate judgments were then compared, and when agreement was lacking, the same five students then sat as a committee in review of such cases.

Of those originally included in the satisfied group it was observed that some were genuinely and completely satisfied and expressed enthusiasm about retirement. Others were in different degrees of satisfaction, they did not complain, they accepted their new status with good grace but gave no evidence of profound satisfaction in their report. To differentiate those finding greater satisfaction in retirement an excellent (E) category was added.

Results

Degrees of Satisfaction.—Satisfaction reactions to retirement experience revealed by the 359 reports are shown in table 1.

Of the 359 individuals, 76 were women and 283 men. The women's returns gave evidence of better average adjustment than the men's. Nearly half of the women were classified in the

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TABLE 1. SATISFACTION REACTIONS TO RETIREMENT EXPERIENCE.

Reactions	Number	Percentage
Excellent	107	30
Satisfied	162	45
Uncertain	75	21
Dissatisfied	15	4
Total	359	100

E group while less than 26 per cent of all men fell in this classification. In the dissatisfied group all but one of the 15 were men. Degrees of satisfaction are shown in table 2.

TABLE 2. DEGREE OF SATISFACTION TO RETIREMENT.

Degree of Satisfaction	No. of Men	No. of Women
Excellent	73	34
Satisfactory	132	30
Uncertain	64	11
Dissatisfied	14	1
Total	283	76

Approach to Retirement.—Each retirant was asked the question "Did you anticipate retirement with eagerness—resignation—dread—?" To this check list were added other types of anticipation by many of the respondents. These answers finally resolved themselves into five categories. The first 300 presented the following distribution (5 of the 300 did not give information on this item while 3 checked more than one item):

TABLE 3. ATTITUDES TOWARDS ANTICIPATED RETIREMENT.

Attitudes	Number
Eagerness	89
Pleasant Satisfaction	33
Indifference and Acceptance	35
Resignation	132
Dread	9
Total	298

Thus 30 per cent anticipated retirement with eagerness and another 11 per cent with pleasant anticipation. In contrast some 44 per cent were resigned to their approaching change in status while 3 per cent admitted dread. Another 12 per cent reported indifference or acceptance, in a few cases rebellious acceptance.

We should now inquire what sort of prognosis these different attitudes present towards later satisfactions or dissatisfactions in retirement. Table 4 gives the distribution of at-

TABLE 4. ATTITUDE OF ANTICIPATION AND LEVEL OF RETIREMENT SATISFACTION.[1]

Attitude	Number	Level of Later Satisfaction		
		Excellent	Satisfactory	Uncertain or Dissatisfied
Eagerness	89	50	35	4
Pleasant Anticipation	33	17	15	1
Indifference	35	8	18	9
Resignation	132	25	47	60
Dread	9	0	0	9
Total	298	100	115	83

[1] The chi square for the above classification is 92.2. The chi square value for 8 degrees of freedom with a probability of .01 is 20.1. With a probability of .001 the value is 26.1. If the foregoing table is considered as based on a random sample it would follow that there is a marked association between attitudes of anticipation and the post-reaction toward retirement.

titudes of anticipation in relation to level of retirement satisfaction.

While attitudes of eagerness or pleasant anticipation offered good prognosis for later satisfaction in retirement we found that 5 of these were classified as uncertain in their present reaction. None were classified as dissatisfied. In contrast none of the 9 who admitted dread were found in either the excellent or satisfied groups. On the other hand attitudes or resignation or indifference gave no clear prognosis of either satisfaction or dissatisfaction. About 1 in 5 of those resigned to their changing status were later included in the excellent classification and well over half among either the excellent or satisfied retirants. Only 60 of the 132 who reported attitudes of resignation were found among the uncertain or dissatisfied retirants. There is ample evidence that many who approached retirement with certain doubts and hesitation later fared very well in the retirement experience.

Fields of Previous Activity.—The fields of previous activity for each of the 300 retirants reporting first were narrowed into four classifications—Executive, Humanities, Science, and Social Science. Each field was then analyzed for the proportion of satisfied and dissatisfied. Only the executive group revealed a significantly higher rate of satisfaction than the others. Twenty-one out of the 24 included in this group revealed a satisfactory or excellent reaction. For the other three fields there is no indication of significant average difference. The social science group revealed less tendency towards excellent reaction than those from science or humanities but its total of those who revealed satisfaction, including the excellent, was close to that for the other groups.

Income of Retirants.—Three questions were asked regarding income: How have you met the problem of living on a reduced income? What percentage of your former salary (last ten year average) is your retirement allowance? and What is your present income including all sources?

Out of the first 300 reports, 171 individuals, or 57 per cent, stated that they experienced no difficulties living on their present income and there was no change in their standard of living. Twenty-eight of the 171 had the same income as before retirement or an increased income.

Only 8 of the 171 who experienced no difficulties stated that their retirement allowance by itself was adequate. The others had made preparations to supplement their allowance with other means of income such as book royalties, investments, savings, insurance, property, inheritance, and part time or full time employment. Twenty-one had full time employment and were retired only from their former position.

The remaining 129 individuals out of the 300 found it to be a problem to live on a reduced income. Very few, however, admitted any severe difficulty. Incidentally, of the 5 who reported considerable difficulty, only 1 received less than $100 a month, while 2 had incomes of over $300 a month.

Practically all of the 129 said they met the problem either by living economically, budgeting, or leading a simple life.

The most frequently reported adjustments to reduced income involved: 1. Sharing expenses with a sister, brother, other relatives, or friend. 2. Wearing old clothes longer. 3. Traveling less. 4. Attending concerts, movies, etc., less frequently. 5. Releasing of cooks, maids, or other help and doing own housework and yard work. A somewhat smaller number helped to meet the problem by the renting of rooms, sale or mortgage of home or car, moving to cheaper residence, less entertaining, resigning from expensive organizations, reducing purchases of books and magazines, contributing less to charity, and occasionally cashing in insurance policies.

The most severe adjustments were made by those with least income. Twelve of the 13 with retirement incomes under $100 found it necessary to economize on living expenses while 47 of 81 received between $100 and $200 and

only 33 of 64 with incomes between $200 and $300 reported necessary retrenchment here. Only 36 of the 143 receiving $300 or over indicated any curtailment in living expenses.

Interests and Hobbies.—An analysis of the interests reported by retired professors revealed a decided variation among these retirants. As many as fifteen different interests were reported by one respondent while another reported not a single interest or hobby. It must be recognized that these reports doubtless represent an under-enumeration of interests. Further they leave much to be desired in attempting any critical analysis of these items. The development which follows may prove of greater value in suggesting later studies where the factor of control is observed in a more satisfactory way than in this exploratory investigation.

Aware of these limitations, analyses were made on the bases of number, range and intensity of reported interests. I believe that each of these factors is of significance in determining our satisfactions at any stage of life. They do not, however, apply in equal force in each particular case. One finds a degree of satisfaction (at least an escape from boredom) in moving from one established interest or hobby to another. Others may realize contentment in the intensity of interest in perhaps a single hobby or activity. This difference is not peculiar to those in retirement; it is also common to children, housewives, and men in the working years.

The number of interests were classified as many, moderate, and few. No more than two interests were rated as few, from three to five as moderate, and six or more as many. On this basis 92 of the first 310 reporting claimed many interests, 148 had moderate, and 70 only few interests (table 5).

Relation of the number of interests to the degree of satisfaction in retirement is indicated in the following table. A casual inspection reveals some positive correlation between the number of interests and the degree of satisfaction experienced in this period of life. However this general tendency does not explain the 12 excellently adjusted persons who reported but few interests nor the dissatisfied one who claimed many interests. These exceptions may sometime be accounted for in the intensity of interest. One of the 12 with E rating suggests this in his comment, "It all depends upon the individual." His interests were few but they were time and energy consuming for they centered about a farm home.

TABLE 5. REACTION TO RETIREMENT AND NUMBER OF INTERESTS.

Reaction to Retirement	Number of Subjects	Number of Interests		
		Many	Moderate	Few
Excellent	100	45	43	12
Satisfactory	125	32	58	35
Uncertain and Dissatisfied	85	15	47	23
Total	310	92	148	70

A second classification was made on the basis of range of interests. Three classes were established as follows: varied interests in several fields, wide interests in a single field, and narrow interests in a single field.

Of the 298 whose range of interests permitted classification 133 had varied interests, 94 wide, and 71 narrow interests. The relation of this distribution to degree of satisfaction is indicated in table 6.

One observes here some general tendency of association of varied and wide interests with greater satisfaction in retirement. However here again there are numerous exceptions not in agreement with this tendency.

A large number of the records did not lend themselves to a satisfactory analysis of intensity of interest. Although no distribution of response relative to this item can be made, a review of the cases of those reporting few interests or narrow interests did suggest that

TABLE 6. REACTION TO RETIREMENT AND RANGE OF INTEREST.

Reaction to Retirement	Number of Subjects	Range of Interests		
		Varied	Wide	Narrow
Excellent	100	64	23	13
Satisfactory	114	43	37	34
Uncertain and Dissatisfied	84	26	34	24
Total	298	133	94	71

satisfactions were often related to the factor of intensity of interest.

A sense of the "worth-whileness" of the activity also seemed to have significant bearing on the retirant's degree of satisfaction. In many cases the feeling of usefulness of an activity seems to determine the zest which one possesses for for it. Some reported great satisfaction in their welfare efforts since they regarded these as good and useful. Even here there were exceptions. Some were definitely bored. For instance, two people indicated interests in gardening and welfare work. The first was dissatisfied, the second very happy.

Nor should we hold too firmly to the rule of usefulness and "worth-whileness." A number of the satisfied ones were engaged in activities which yielded satisfaction only to themselves. One of them had written a novel which he knew would never be published. He found real enthusiasm in this work and in no way regarded his effort as wasted. Others discovered zest in forms of creative art which possess neither artistic or utilitarian uses. While some very general tendencies might be observed in averages, the honest reporter must finally admit the old adage that "one man's meat is another's poison."

One fact however stands in clear relief. The interests which were reported were in the great majority of cases interests established long prior to retirement. Less than one-fifth of the respondents reported new interests after reaching retirement.

Employment.—Each retirant was asked the two following questions regarding employment:

1. If you have sought new employment since retirement what difficulties have you experienced?
2. If you have had regular or part-time employment since retirement indicate the nature of this employment together with any satisfactions you have received from this new experience.

Of 318 whose records were covered for these items only 135 had sought employment or had it offered to them. Of these 7 did not find acceptable employment. Of the 128 who were employed either regularly or part time only 26 indicated that they had sought their present employment. Only one-third, or 43 of the 128, held full-time jobs.

Most of the part-time and full-time retirants continued in some form of college work. Many were continuing because of the demands of the war training programs. Only 27 had entered new fields and in most cases the new fields were somewhat similar to their old ones. Fifteen of these had become consultants. In addition to teaching the retirants occupied themselves with social work, work on draft and ration boards, as correspondents and editorial writers.

Other activities included the following. Nine entered the field of business either as bookkeepers or as executives. Two operated their own business. Six went into church work, two of whom were ministers. One each entered the following occupations or activities: designer of machine parts, printer, botanist in a museum, inspector of schools, clerk in department store, medicine, park commissioner, director of museum, interpreter, weaving, library and indexing books.

Of the seven who sought and did not find acceptable employment all but one was classified in the Excellent and Satisfied group. Employment was turned down because of the

"necessity of joining a union," "too much governmental regulation," or that there was "not enough money involved."

There was very little difference in the percentages that were employed in the Excellent and Satisfied groups and the percentages of these two groups for all cases. The 128 who were employed rated 33 per cent in the Excellent group and 42 per cent in the Satisfied group compared to the 34 per cent and 40 per cent for these two groups in the total distribution.

It should be borne in mind that this investigation was made during war years. A number of the 128 who reported employment indicated a patriotic prompting in their return to work. Others who wished work or needed additional income found less difficulty in securing work than may be the case in more normal employment periods.

Further it is not clear that all the 128 who indicated employment were reporting paid employment. Several reported work in activities that usually imply free service but which occasionally involve a wage or salary. Of the 190 who reported no employment, some were unemployable for health or physical reasons, some were content in their freedom from compelling duties, and a great number found their time and energy employed in their hobbies and personal interests.

Personal and Social Problems.—Each retirant was asked to comment on how he met the following problems: keeping active, loss of former social groups, and declining energy and health.

In considering the problem of keeping active three classifications were employed: those who were having no trouble keeping active; those who were more active or had too much to do; and those who were having trouble keeping active. With but a few exceptions the 318 individuals reporting on this question had no trouble in finding activities to occupy their time. These activities included all kinds of outdoor work and sports, household duties, creative work such as writing and painting, church and community activities, part-time teaching and lecturing, and some work in either new fields or fields related to former service. At least 27 stated that they were busier than formerly or that their problem was not in finding something to do but in finding time for what they had to do. Only 5 indicated that they had trouble keeping active. However, some of their reasons indicated that they meant physically active.

As may be anticipated the older retirants more frequently mentioned loss of former social groups. Some who had moved from their former communities and were unable or unwilling to replace former friends with new also indicated an empty social experience. The most frequently reported loss was that of contact with students and faculty. The great majority however seemed to have kept their social fences in fair repair and many of the retirants reported new friends and new associations to replace the old.

For the most part declining energy and health was credited as presenting no problem. It is surprising to note the number who boasted about their good health or who claimed to be in better health than before retirement. Those who admitted that their health and energy were declining largely accepted this as normal, inevitable, or to be expected. Only a small number indicated a negative reaction to this problem. Those admitting such a decline mentioned the expected solutions to the problem, such as: slowing down, resting more, watching diet, and having check-ups.

As far as these three problems are concerned, the majority of this group have indicated that they have met them well. Perhaps this has been a select group, or perhaps these individuals are reluctant to admit having any problems.

Mobility and Changes in Residence.—Each retirant was asked the following questions:

"What changes have you made in living or housing arrangements?"

"If you have moved from the location of your last position, what influenced this decision?"

Of the 318 cases usable for this analysis 177, or 59 per cent, indicated that they had not moved from the locality or their last position nor had they made changes in living or housing arrangement. Since some of these were but recently retired and a number were continuing to give part-time service due to the war emergency, this figure represents a somewhat higher nonmovement than will ultimately occur. In addition to these 177 another 24 had made residential change but remained in the same community.

Thus at the time of this study about two-thirds remained in the location of their last position. It is also quite probable that several of the 20 who reported living with relatives, the 30 living in hotels, apartments, and rooming houses, and the 2 in old people's homes also remained in the area of their last position. A number of these failed to indicate whether the adjustments which they made were in or away from their previous location.

Seventy more of the group definitely indicated leaving the former community, 42 of these moved to smaller towns or villages, 21 to the open country, and 6 to larger cities. It will be observed that to the extent that changes in size of community occurred the pull for retired university personnel was decidedly toward smaller instead of larger places.

Changes in housing and living arrangements appeared most frequently in the lower income group. When compared with reported retirement incomes it was found that 10 of the 13 with less than $100 per month made such changes while less than one-third (44 of 143) of those receiving $300 or more per month indicated adjustments of this nature.

Of the 137 who had effected housing changes, the following reasons were indicated. Since a few indicated more than one reason the total exceeds the number of respondents.

32 to be near relatives and friends
30 financial considerations
28 desire to leave university surroundings or to give successor a free hand
18 climate
13 outdoor activity
10 to "look after" property
10 new positions
7 location of early home
7 new interests
2 old people's home

There is no clear pattern apparent from the study. Each case is an individual adjustment to an individual problem. Those who changed their housing and living arrangements did so because their particular case required such an adjustment or because their individual desires influenced them. However it does seem that the desire to re-establish (or escape) certain social and kinship groups, economic factors, and consideration of climate appear more frequently than others.

The Retirant's Family.—The 318 retirants reported only 403 children, which supports the generally accepted low replacement rate for college and university professors. When the number of children per family was compared with the degree of adjustment some but no decided advantage was found for those with larger families.

While many derived great satisfaction from the successes and accomplishments of their children as well as from association with grandchildren, one senses that occasionally children and grandchildren were also causes of disappointment. Further, those without children were frequently excellently adjusted with interests other than offspring. While in many cases real pride and joy came from the continuance of the family line and in the association of several generations this cannot be regarded the sole or even the most important factor in the adjustment of many of the retired educators.

Children were more numerous among those with high retirement income than those with low. Nearly two-thirds of the group receiving $300 or more per month in retirement income reported children while only about 1 in 4 (27 per cent) of those with incomes of $100 or less

indicated children. If present retirement income can be assumed to reflect earlier degree of success, then the finding supports previous studies which conclude that the more successful within a particular field of competition have more offspring than the least successful (1).

Widowhood did not seem to significantly affect happiness in retirement in those cases where widowhood preceded retirement. In contrast those widowed after retirement showed a lower happiness rating. Table 7 indicates this difference in adjustment.

TABLE 7. ADJUSTMENT RATINGS OF WOMEN WIDOWED PRIOR TO RETIREMENT AND AFTER RETIREMENT.

Adjustment Rating	Widowed Prior to Retirement	Widowed After Retirement
Excellent	9	7
Satisfactory	8	7
Uncertain	6	8
Dissatisfied	0	2
Total	23	24

It will be noted that the adjustment rating for the first group is higher than for all retirants. The lower rating for the second group doubtless results from the fact that the adjustment to widowhood came later in life when dependency upon one's mate is frequently greater. Further, those widowed before retirement anticipated the retirement period without the benefit of mate and did not experience the frustration which came to those who had planned a joint experience.

Satisfactions and Dissatisfactions.—The following analysis is made on the basis of answers to the following questions: "What experiences do you find the most satisfying in being retired?", and "What experiences do you find the least satisfying in being retired?"

For the most satisfying experience in retirement, 82, or 27 per cent, of the 300 retirants indicated freedom from schedule and routine. In addition 213, or 71 per cent, expressed the satisfaction of having free time and independence. Only 16, or 5 per cent, listed the opportunity to cultivate new friends. Twenty-three, or 7 per cent, gave no indication of having any satisfying experiences in retirement.

For the least satisfying experiences in retirement, 45, or 15 per cent, of the 300 retirees indicated that one of their least satisfying experiences was the loss of contacts with students. Sixty-seven, or 22 per cent, regretted the loss of contacts with colleagues and college environment. Twenty-nine, or 9 per cent, were dissatisfied because they were not teaching. Forty-seven, or 15 per cent, found poor health and old age a dissatisfactory experience. Twenty-four, or 8 per cent, complained of a feeling of uselessness.

In a few cases it was impossible to classify the retirants' statements according to the above categories. These answers are interesting because of their diversification. For example, there were 6 retirees who stated that their most satisfying experience was getting away from students. One retirant indicated that his least satisfying experience in retirement was not living by a schedule. Another said that he was dissatisfied because he felt that he had lost his independence since his only income was a pension. Still another expressed least satisfaction in not seeing others take his former position as seriously as he had.

In the final analysis it seems that the most satisfying experience in retirement was having free time and independence. This seems to be the normal reaction after living by a schedule. Most of this time was spent continuing along the same lines in which the retiree was formerly engaged, either through reading, writing, or research. The least satisfying experiences involved the loss of contacts with students or colleagues. The retiree missed the youthful and stimulating environment in which he formerly lived.

Suggestions to Others Approaching Retirement.—Of the first 300 respondents 262 in-

dicated one or more suggestions to others in their profession who might be approaching retirement. The Dissatisfied and Uncertain group more often failed to make such suggestions than the Satisfied and Excellent groups. The response from the E group to this item was 95 per cent. Further, the responses from this group reflected a spirit of hope and stressed personal control quite in contrast to the evidence of resentment and disappointment and being subject to conditions beyond their control indicated frequently by the Dissatisfied group. Taking the group as a whole most of the suggestions were related to adequate income, the range and intensity of interests, congenial associates, and future living arrangements.

A critical examination of the reports to determine the agreement existing between suggestions and the personal preparation and adjustments made by each respondent revealed that 222 of the 262 who responded on this item lived about the kind of lives which they recommended to others. An additional 31 revealed some but not complete agreement between their lives and their suggestions. Only 9 gave advice which was unsupported by their own experience. One of these was a widower with two children. Now 79 and retired six years, he has no other interest than reading and is subject to morbid contemplation. He is one of the dissatisfied group. He writes:

> "If I could go back I would not develop so much of a one track mind, giving myself wholly to the work and to special tasks of my profession. I would provide myself with worthwhile hobbies and unprofessional interests. I had never learned the arts of leisure in life."

In conclusion, the preceding analysis singles out both the nature of certain problems of retirement and in some cases the incidence of these problems as sensed by annuitants under the T.I.A.A. in 1946. It must be recognized again that later studies will doubtless reveal a significant change in the incidence for some items. Particularly the adequacy of retirement income would show decline if we were to resurvey this group today. The percentage employed would also likely decline. It must also be borne in mind that this was a pilot study. Later studies of retired professors should achieve a more effective sampling procedure if our purpose is to establish the incidence of different retirement experiences for professors.

Summary

Analyses of the records of retirement experience of some 359 retired professors, made possible through the cooperation of the TIAA, gives us information on the adjustments to retirement experience for this occupational group. Such items as their degrees of satisfaction and dissatisfaction, their problems of income, and their employment or attempted employment in retirement years receive attention. The group who move from their home community is compared with those who remain in the location of their last assignment.

The relation of marital factors, children, and grandchildren to happiness in the retirement period reveals no marked correlation between happiness and the presence or absence of children. Further, widowers who lost their mates some years prior to retirement seem to fare quite as well as those whose mates survive. However, those who experience loss of mate after retirement reveal distinctly lower satisfaction with their lot.

A revealing comparison of the happy and unhappy retirants is found in their suggestions to others approaching retirement. The suggestions of the former are largely in agreement with their own experience whereas the suggestions of the discontented are quite in contrast with what they themselves experienced. Special analysis is made of the most dissatisfied retirants.

It is quite impossible to separate the adjustments and reactions peculiar to retirement from those which attend the processes of aging irrespective of retirement.

The selection of the sample from which this study is drawn may raise the question as to

whether it is truly representative of the total body of retired professors. On the other hand there is every reason to believe that the analyses reveal the range of reactions and attitudes to retirement as well as indicate the bases of satisfaction or dissatisfaction in retirement experience.

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Steroid Hormones and Aging: A Review

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The existing knowledge concerning the changes which occur in cellular metabolism with aging is very limited. Since also very little is known about the effects of the steroid hormones on the metabolic functions of the individual cells, a review on steroid hormones and aging must at the present time be limited to a summary of the grosser metabolic changes affecting the various organs or concerning the body as a whole. In addition references will be made to anatomic changes producible in the aged organism by administration of steroid hormones. In spite of these limitations the field of steroid hormones already constitutes one of the most promising subdivisions of the science of gerontology.

The presentation can naturally be divided into two sections, one dealing with the effect of age on steroid hormone production, and the second with the effect of steroid hormone administration on the aging manifestations.

Of the 28 steroid hormones isolated from human organs or secretions only the androgens, estrogens, and adrenal corticoids will be considered, since the knowledge concerning the biologic aspects of the remaining steroids in aging is still incomplete. According to the present concept the androgenic hormones are produced by the interstitial cells in the testes, and in the adrenal cortex, the estrogenic hormones in the ovaries, adrenal cortex, and Sertoli cells of the testes, and the corticoids in the adrenal cortex. Since the adrenal cortex takes part in the production of the three groups of hormones mentioned these steroids will be found both in the human male and female, although in quantitatively different amounts.

Concerning the important subject of the effect of age on the steroid hormone production the available data, most of them from the last few years, are fairly complete, and the results of the different investigators on the whole in good agreement.

In human individuals the excretion in the urine of androgenic (e.g., androsterone) and nonandrogenic (e.g., etiocholanolone) neutral 17-ketosteroids is believed to constitute a fair measure of the production of androgens in the body. This contention is supported by the finding of low excretion values in castrates and in individuals with Addison's disease and by observations of excessive excretion of these metabolites in patients suffering from androgen producing tumors of the testes or adrenals. It is noteworthy that all the investigations which have dealt with the excretion of androgenic and nonandrogenic neutral 17-ketosteroids in the urine have shown a gradual but definite decrease in the steroid excretion with advancing years.

This may for instance be seen from the observations by Hamburger, Halvorsen, and Pedersen (18), who determined the 24-hour androgen excretion in the urine in 50 men between 30 and 80 years, using the capon's comb method. The analyses showed a reduction in the mean excretion value from 55 I.U. at the age of 30 to about 8 I.U. at the age of 80. Although a considerable scattering of the androgen excretion figures within the various age groups was noted the curve representing the mean figures shows a gradual decline with age in excretion values and not a sudden drop. This absence of a sudden decrease in the androgen excretion in men is usually accepted as evidence against the assumption of the existence of a true male climacterium.

The output of androgenic substances in the urine in women, as determined by the capon's comb method, is considerably lower, valuing only about one-third of the male excretion figures. The curve for the excretion also in the women shows a gradual decline with advancing years (30). This reduced excretion probably reflects a decreased production of androgenic hormone by the adrenals.

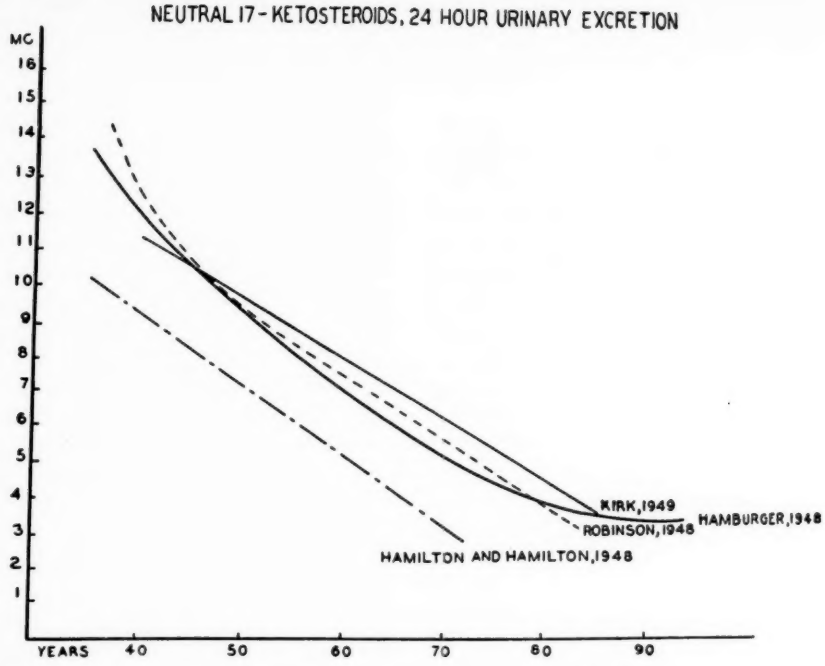

FIG. 1. Comparison of ketosteroid excretion values in men reported by various authors (23).

The determination of urinary androgens by the capon's comb method is rather laborious, and it is therefore not surprising that most of the studies on the effect of age on the androgen production have been based on the much simpler colorimetric determination of the total urinary neutral 17-ketosteroid excretion. The curves representing the 17-ketosteroid excretion show, as did the curves based on the biologic assay of androgens in the urine, a gradual decline with advancing years both in the men and the women. As shown for instance by Hamburger (17), the urinary excretion between the ages of 30 and 90 years in the men declines from about 15 to 4 mg. per twenty-four hours and from about 10 to 2 mg. in the women. The excellent agreement found between the observations of various investigators may be seen in figure 1, in which a comparison is made of the 17-ketosteroid values in men, as reported in four different studies during the period 1948 to 1949 (23). In this illustration the curves expressing the effect of age on the 17-ketosteroid excretion show practically the same slope.

It is important to point out that whereas the androgen excretion shows the same tendency to decline with age in both men and women, the effect of age on the excretion of estrogenic hormones is quite different in the two sexes. The excretion of estrogenic steroids in the urine is believed, on the basis of physiologic and pathologic observations, to be a reasonably good measure of the estrogen production in the body (just as the excretion of androgenic steroids affords a fair measure of the androgen production). The estrogen analyses of the urine reveal practically the same excretion values in young and in old men, the excretion amounting to about 12 rat units per twenty-four hours. In the women, however, the excretion of estrogens during the reproductive

period of life is considerably higher, 35 to 40 rat units daily, but in relation to the menopause drops steeply. This different behavior of the estrogen curve with age can be seen clearly from as yet unpublished observations by Pincus (31) on 237 men and 253 women (table 1).

TABLE 1. THE 24 HOUR URINARY EXCRETION OF ESTROGENS IN 237 MEN AND 253 WOMEN. G. Pincus: Personal Communication[1]

Age	Total Estrogens Rat Units per 24 Hours	
	Men	Women
17–29	11.7	38.2
30–39	13.8	38.9
40–49	12.3	21.3
50–59	13.7	10.8
60–69	12.5	6.7
70–79	12.4	7.3
80–96	10.5	6.7

[1]According to Pincus the figures represent tentative values.

The steep decline in the estrogen excretion with the onset of the menopause is also evident from a recent publication by Pedersen-Bjergaard and Tønnesen (30), based on observations on 360 women.

The question may here be asked: What is the cause of the marked decrease in the androgen excretion in the men with age and of the abrupt fall in the estrogen excretion in relation to the menopause?

I believe that the existing histologic evidence favors the contention that the decreased androgen production in men with age is caused by regressive changes taking place in the interstitial tissue of the testicles. That such regressive changes in the testes in elderly men should be secondary to age changes in the pituitary does not seem very likely since the hypophysis in old individuals is known to contain large amounts of gonadotropin and, as a matter of fact, often larger amounts than found in young adults. This increased production of gonadotropin by the pituitary of old men is similar in nature to that observed after castration of young adults and has the character of a compensatory mechanism. These facts suggest that the primary reason for the lowered androgen production in old men must be sought in the testis itself, whereas the pituitary also in aged men is capable of responding in essentially the same way as in earlier periods of life.

The abrupt fall in the estrogen excretion of women in relation to the menopause coincides with the marked involution of the ovaries which can be observed histologically at this period of life. Since the gonadotropin production by the pituitary of elderly women has been found to be higher than in young adults, the cause of the decreased estrogen production in the older women must undoubtedly be sought in regressive changes in the ovary itself.

It might be well at this stage to consider what are the effects of the reduced androgen production in old men and of the decreased estrogen secretion in the postmenopausal period of life. It is generally assumed that lack of energy, moderate mental depression, and reduced sexual activity may be correlated with the reduced androgen production in elderly men, since a relief of these symptoms is not infrequently noted after administration of testosterone. The correlation in the women between the climacteric signs (hot flashes, tiredness, mental depression, nervousness) and the decreased estrogen production would seem to rest on an even firmer basis since these complaints are usually markedly alleviated by estrogen therapy.

While this relationship between the involution of the steroid producing tissue of the gonads and the enumerated signs and symptoms thus on the whole seems to be fairly well established, this does not imply, of course, that these symptoms in old individuals are always conditioned by the decreased production of sex hormones. Other etiologic factors may produce the same clinical signs, and among these, primary age changes in the various organs

themselves probably hold an important place. This simply means that regressive changes in the organs with age may take place independent of the degree of steroid stimulation.

A special consideration should be given to the interesting fact presented in table 1 and fig. 1 that the estrogen excretion in men tends to remain unchanged with advancing years, whereas the androgen production usually shows a definite fall. This different behavior of the two groups of steroids in the males results in a change of the androgen/estrogen ratio, so that with advancing age the estrogens will show a relative predominance over the androgens as compared with the prevailing condition in earlier adult life. Table 2 shows the observed androgen/estrogen ratio in 204 men between 17 and 96 years studied by Pincus (31).

TABLE 2. THE ANDROGEN/ESTROGEN RATIO IN 204 MEN OF VARIOUS AGES
G. Pincus: Personal Communication[1]

Age	Androgen/Estrogen Ratio[2]
17–29	13.9
30–39	10.9
40–49	....
50–59	7.0
60–69	6.4
70–79	6.8
80–96	2.6

[1]According to Pincus the figures represent tentative values.

[2]Androgens: Ketonic androgens expressed as milligram androsterone equivalent per hour × 1000. Estrogens: Total estrogens in rat units per twenty-four hours.

This considerable change in the ratio between the two groups of steroids will lead to an increased estrogen stimulation of those tissues in the male organism sensitive to such stimulation, or, in other words, to a certain feminization. Of the organs sensitive to estrogen stimulation especially the prostate and the breasts have received attention. The influence of the increased estrogen activity on the prostate is believed to be responsible for the tendency to development of prostatic hypertrophy with advancing years, whereas the effect of estrogens on the breast is thought to be of importance for the development of gynecomastia in elderly men.

As far as the adrenal corticoids are concerned, the available data on the effect of age on the urinary excretion of these hormones are not as yet as complete as is the case with the sex hormones. Unpublished observations by Pincus (31) on a large group of men and women between 17 and 96 years fail to show any definite reduction in the excretion of neutral reducing lipids with age (table 3), but it should be mentioned in this connection that observations on the urinary excretion of corticoids probably are not of the same significance for the evaluation of the corticoid production in the body as are the excretion values of androgens and estrogens for estimating the formation of sex hormones, since the amounts of corticoids excreted in the urine are believed to represent only a small part of the total amount of corticoids produced in the body.

TABLE 3. THE 24 HOUR URINARY EXCRETION OF NEUTRAL REDUCING LIPIDS IN 237 MEN AND 253 WOMEN.
G. Pincus: Personal Communication[1]

Age	Neutral Reducing Lipids Mg. per 24 Hours	
	Men	Women
17–29	2.2	2.0
30–39	2.0	2.2
40–49	2.6	2.1
50–59	2.3	1.7
60–69	1.9	2.1
70–79	1.9	1.9
80–96	2.3	1.6

[1]According to Pincus the figures represent tentative values.

In the last few years other valuable methods have, however, been developed for the evalua-

tion of the corticoid production by the adrenals. These methods, as it is well known, are based on the stimulation of the adrenals by injection of ACTH and observations on the resulting drop in blood eosinophiles and changes in the uric acid/creatinine excretion ratio. By substituting epinephrine for ACTH the ability of the pituitary to release ACTH may be studied by the same procedures.

Important results with the use of such technique in young and in old men have recently been published by Solomon and Shock (33) and by Pincus (32). In the studies by Solomon and Shock the responsiveness of the adrenal cortex was evaluated in 27 young and 26 aged men who were given 18 mg. of ACTH, and the pituitary responsiveness in 15 young and 13 aged men who received 0.4 mg. of epinephrine. No difference in the eosinopenia was observed after ACTH, but epinephrine was found to produce a significantly greater eosinophil depression in the young men than in the aged.

It was concluded from these investigations that the ability of the adrenal cortex to secrete hormones of the 11-17 oxysteroid group under ACTH stimulation is not grossly impaired in senescence but that the response of the pituitary to acute epinephrine stimulation is moderately reduced in the aged. Since normal functional responsiveness of the adrenal cortex was found maintained in the ACTH experiments, the long term pituitary output of ACTH cannot be notably reduced in old individuals.

In similar studies on 54 young men and 30 older men, Pincus (32), using an ACTH dose of 25 mg., likewise was unable to demonstrate any significant difference in the adrenal cortical response between the two groups. No definite difference was found either when three other tests of acute stress (the pursuit meter test, glucose tolerance test, and target ball frustration test) were applied.

Although these important observations certainly indicate a practically preserved mechanism in old age for dealing with various forms of experimentally applied stress, the findings by Solomon and Shock on the effect of epinephrine injections suggest that the response of old individuals to all kinds of acute stress may not be the same as that of young persons. The experience of many surgeons that old patients seem to be less affected by operative procedures than are younger adults would tend to indicate either that the pituitary stimulation under these conditions results in a lower output of ACTH or that the peripheral receptors for the stress are less sensitive because of age changes in these receptors. I think this latter possibility should always be kept in mind in the interpretation of acute and chronic stress experiments in the aged.

The second part of the review will deal with the effects of steroid hormones on the aged organism. In discussing such effects it is important to remember that a lack of response of an organ may be due either to the fact that the steroid hormone has no specific effect on that organ or to a loss of ability of the organ to respond on account of age changes to an otherwise adequate stimulus.

The observations on the effect of steroid hormones on the aged organism date back more than sixty years to the study in 1889 by Brown-Séquard (3, 4, 5) on the effect of injection of testicular extracts into senile men, but it was not until the individual steroids were isolated and identified during the last decades that more reliable information on the action of steroid hormones on old individuals was obtained. Most of these investigations are from the last few years and have chiefly included observations on the effect of androgen and estrogen administration.

In reviewing the field of steroid therapy a distinction can naturally be made between the effects of the hormones on the generative system and secondary sex characteristics on the one hand and the action on nongenerative organs on the other. Following administration of testosterone to old men an improvement in sexual function is occasionally seen, having the character of increased potency. The mechanism of action of the steroid in producing this

improvement is not known. The possibility exists that an effect on the tone and degree of development of the ischiocavernosus and bulbocavernosus muscles may be of some importance in this respect. Thus it has been shown by Wainman and Shipounoff (34) that these muscles in animals are particularly sensitive to androgen stimulation and that the atrophy of these muscles of the penis, which occurs in rats after castration, can be abolished by testosterone treatment.

It is interesting that the secondary male characteristic, the beard growth, as demonstrated by Chieffi in quantitative studies (7), will show a definite increase in old men following testosterone therapy.

Concerning the effect of androgens on organ systems other than the sex-linked ones the ability of this group of steroids to cause nitrogen retention with increased protein synthesis and weight gain (the so-called anabolic effect of the androgens) is probably the most striking (19, 20, 26, 27). Although it is true that the response in old individuals generally is somewhat smaller than in young adults, a weight gain of 8 to 10 lbs. over a four to eight week period may quite frequently be seen in subjects over 70 years of age. This positive nitrogen balance is usually associated with some increase in muscular strength. Just as it is the case with younger adults the positive nitrogen balance and increased protein anabolism can be obtained only for a limited period of time and do not persist long after the cessation of androgen administration.

The effects of estrogen therapy in postmenopausal women have been studied to an even greater extent than the androgen supplementation to elderly men, and it is generally agreed, as mentioned previously, that a number of complaints characteristic of this period of life may be eliminated. While this response to estrogen therapy in 45 to 60 year old women is well established, the observations by Allen and Masters (2, 29) on the effect of estrogen administration to 64 to 82 year old women are of even greater gerontologic interest.

As shown by Allen and Masters it has been found possible by estrogen injections (in doses of 1 to 3 mg. weekly) to provoke uterine bleeding even in senile women, a bleeding, which by intermittent withdrawal of the estrogen or by supplementary progesterone administration, may be made to assume the character of a regular cyclic menstruation. In connection with these hormonally induced menstrual periods the atrophic senile mucous membrane of the vagina assumes the appearance of that of a younger woman, and cyclic accumulation of glycogen and cornification of the vaginal epithelial cells occur. The previously atrophic uterine mucosa at the same time increases in thickness and becomes succulent with development of deep endometrial glands. The blood supply to the uterus is also increased as indicated by the demonstration in histologic sections of many newly developed arteries. Some increase in the size and consistency of the breasts is likewise frequently noted during the prolonged estrogen treatment of the old women.

During the last year the psychologic condition of these old women has been carefully evaluated by Caldwell and her associates (6) and a definite improvement in memory and motivation has been observed in several of the psychometric tests applied.

A few investigations have also been performed in which estrogen was given to old men. In these individuals some increase in the size of the breasts occurred. It could be shown that the gynecomastia actually represented an increase in the amount of glandular ducts present and not merely an increase in the fat tissue of the organ.

The dramatic response of the senile female sex organs (except the ovaries) to estrogen administration has in many respects the character of a rejuvenation, and the question presents itself whether a reversal to a more youthful condition may also be observed in some nongenerative organs as a result of estrogen therapy. Such other tissues in which some restorative changes may be seen are the nasal

mucosa and the skin. In old individuals the columnar ciliated epithelium of the nasal mucosa will frequently be found replaced by a low, nonciliated epithelium. After parenteral treatment with estrogen a return of the nasal mucosa to the youthful columnar ciliated epithelium is often noted (28). This restitution is accompanied by the appearance of an increased number of secretory nasal glands and by an augmented vascularization of the mucosa and submucosa.

The effect of estrogens on the character and appearance of the skin of elderly individuals is also of considerable interest. As is well known, estrogen containing creams have been used in the cosmetologic practice for several years, but until the last few years no scientific studies on the effect of such local estrogen application have been available. In 1946 M. Goldzieher (15) showed that the application to the skin of old women of an ointment containing 1 mg. of estradiol per ounce for a period of six weeks resulted in a striking increase in the number of layers of the surface epithelium and in the development of epidermal pegs projecting into the cutis. In the cutis itself an increased number of capillaries and disappearance of the fragmentation of the collagenous fibers were noted. In addition more elastic fibrils were developed as the result of the estrogen application. In later studies by J. and M. Goldzieher (13, 14) on old men and women, similar regenerative changes were noted in the epidermis, not only after local treatment with alpha-estradiol, but also after application of beta-estradiol, estrone, testosterone, and methyl-androstenediol. Regeneration of the elastic fibrillar network was observed in about half the patients treated with estrogen preparations, but in only 20 per cent of the old subjects treated with testosterone ointment.

The changes produced in the skin of old individuals by treatment with steroid hormones have further been studied by Chieffi (8, 9), who measured the elastic properties of the skin and subcutaneous tissues in relation to topical application of alpha-estradiol benzoate in oil. The measurements were performed by a modification of Schade's method (25), in which a weight is placed on the skin and the indentation and subsequent resilience following the removal of the weight registered by levers on a rotating drum. The elastic properties of the skin as measured by this method, and particularly the resiliency, decrease considerably with age (24, 25). In the skin estrogen studies 1 mg. of estradiol benzoate in oil was massaged into a 40 square cm. area of the skin of the lower leg every second day for a period of two months, and measurements with the elastometer performed before, during, and after the end of the two month treatment. It was found that estrogen application in both men and women was followed by a significant improvement in the skin resiliency, an improvement which corresponded in the mean to a rejuvenating effect of about fifteen years, whereas no change in the elastic behavior of the skin was noted in a control area treated with oil only.

Although only rather few studies have been reported, it is generally believed that the estrogenic hormones just as the androgens are capable of producing nitrogen retention and increased protein synthesis (19), and it is contended that the estrogenic hormones in addition possess a stimulating action on the osteoblasts. Since a decrease with age takes place in the androgen and estrogen production in the women with a maintenance of a practically unchanged formation of adrenal corticoid hormones, this alteration in the ratio between anabolic and catabolic steroid hormones may lead to an overweight of the catabolic corticoids as compared with the anabolic androgens and estrogens.

According to Albright (1) one of the consequences of the increased protein breakdown may be a reduction in the amount of organic matrix in the bones with a resulting osteoporosis. It has been shown by Albright that the existing matrix in the condition of osteoporosis is normally calcified so that the disease is not a disorder of calcification. This concept is

most interesting, since senile osteoporosis is one of the most important gerontologic diseases. Following estrogen (or androgen) therapy an increased amount of organic bone matrix is laid down through osteoblastic activity, and this new organic framework subsequently undergoes normal calcification. Although the problem of the senile osteoporosis is still the subject of some controversy, Albright's contributions in this field have already been of significance.

In outlining the action of steroid hormones on aged organs it was pointed out that a lack of effect might be due to an inability of the organ to respond to an otherwise adequate stimulus because of age changes in the organ. As an example the effect of testosterone administration on the prostate of old men may be mentioned. It has been shown by Gutman and Gutman (16) that the acid phosphatase activity of the prostatic secretion is a true secondary male sex characteristic, and this has been amply confirmed by From Hansen (10, 11, 12), who found that testosterone treatment of young hypogonadic men often was followed by an increase in the phosphatase content from a zero value to concentrations close to the normal adult value. Since the acid phosphatase concentration in the prostatic exprimate shows a marked decline with age (21), it was thought to be of considerable interest to investigate if this low concentration could be returned to normal in the same way as is the case in young hypogonadic adults. A group of old men, who on examination were found to have low values of acid phosphatase in the prostatic secretion, were therefore subjected to treatment with 50 mg. of testosterone propionate three times weekly for a period of up to six months, and the phosphatase concentration of the prostatic fluid followed during this therapy (22). It was found that no increase or only a slight increase in the acid phosphatase values occurred, and it could therefore be concluded that the prostate of old men usually was unable to respond to this stimulus which for young men is adequate.

In considering the observed effects of steroid hormone administration in old individuals as a whole, it can be stated that many of the demonstrated changes must be characterized as desirable from a therapeutic point of view. The increased muscular strength, alleviation of mental depression, and improvement of sexual function occasionally seen after testosterone treatment of old men is usually of considerable value, as are also the effects of estrogen administration on the many postmenopausal complaints in the women. It should be mentioned, however, that to the knowledge of the reviewer no data are available which show that such treatments have resulted in any prolongation of the life of the patients beyond the usual life expectancy. It should also be recalled that the steroid hormones do not affect all the senile organs to the same extent, and the possibility therefore exists that the uneven restitution of function may endanger the condition of the patient. Thus in older men with cardiovascular complications the administration of testosterone may cause sufficient augmentation of activity to precipitate a cerebral or cardiac accident and may in this way shorten the life of the individual.

The examples mentioned in the survey of the ability of steroid hormones to cause restitution of the anatomic appearance and of the function of various senile organs are impressive from a theoretic gerontologic point of view, since it has been shown that not only the uterus and vagina but also the mucous membrane of the nose may be restored to a more youthful condition. It is further noteworthy that also the vascular system of the uterus and the nasal mucosa of the aged individuals are capable of responding to steroid treatment with the production of new blood vessels. These findings cannot help but to introduce a certain amount of optimism into the science of gerontology. When atrophic changes, which until the last decades had been considered irreparable, have been demonstrated capable of

restoration, the possibility exists that other organs may also be capable of some reestablishment of function, provided the adequate stimulus for such restoration is found.

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CONTEMPORARY OPINION

Is a Compulsory Retirement Age Ever Justified?

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At the National Conference on Aging called by the Federal Security Agency and held in Washington, D. C., August 13 to August 15, 1950, the method of determining the time for retirement under a pension plan became a controversial subject. Most of those present were opposed to the "on the shelf" psychology for older persons. There was a general belief that retirement should be geared to disability and that abrupt retirement was a bad thing for both the individual and society. Amid this background there were many present who expressed the view that a compulsory retirement age was never justified in a pension plan. The purpose of this paper is to set forth some of the practical reasons why a compulsory retirement age has been established under most of the pension plans now in operation.

Usually the argument centers around provisions in a plan requiring a worker to retire at a specified age. Persons who are thus retired and are satisfied are usually not vocal. Persons who have been retired and resent such provisions frequently complain bitterly. Thus the impression may be created that there is more opposition to such provisions than would be revealed by a statistical review. Chandler (2) circularized a questionnaire among a selected group of superior persons in 1947-1948 to ascertain their attitude toward retirement and old age. One question was, 'What is your opinion concerning systems of compulsory retirement?" Of those who answered the question, 104 were in favor of such systems (though often with reservation) and 19 were against them.

Without attempting to predict the percentage of persons who think that compulsory retirement provisions are never justified, there is no doubt but that some persons hold this view. Some people seem to be convinced that compulsory retirement provisions are never justified. They may know of a particular instance where an individual was forced to retire at 65 when he was mentally and physically capable of continuing his work. They may know that he became embittered by this experience, that his health deteriorated rapidly, and that society lost the benefit of his services after he was 65. They see no justification for a firm adopting a plan that "consigns a man to the scrap heap" after age 65 and that "slams the door of opportunity" on a man who wants to he hired by such firm after age 65. Such provisions seem to be arbitrary and to discriminate against the older worker without rhyme or reason. This view was summarized recently in an article (5) in Reader's Digest: "No one should be retired at 65 unless he so chooses or unless it is medically necessary."

In view of the obvious objections to compulsory age limits, one might expect that provisions for compulsory retirement at a stated age would rarely be found in pension plans—especially since one reason for the adoption of pension plans is to improve the welfare of the participants in their old age. The contrary, however, is true. Such provisions are found in nearly all private pension plans, the Federal Civil Service Retirement Law, and in most state retirement systems.

Sometimes there are provisions permitting some flexibility in the time of retirement up to a stated age—say age 70—when the worker must retire. Sometimes a firm has a custom of retiring most workers at a "normal" retire-

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ment age—say age 65—to which few exceptions are allowed. These latter provisions work out in practice about the same as under a plan with a mandatory retirement date. As the result is much the same whether a man is compelled to retire at a specified age by custom or by law, no further effort will be made in this paper to distinguish between these various types of plans which effect complete cessation of work at some definite age.

One might reasonably ask why provisions for compulsory retirement ages have been so frequently inserted in pension plans when such provisions have the disadvantages mentioned. Are these disadvantages as real as they seem at first glance? Does a compulsory retirement age have some advantages that do not readily meet the eye? These and similar questions will be answered subsequently but, first, let us examine some factors which tend to confuse our study of these questions.

Some of the confusion comes from the loose use of the word "retirement." Sometimes the speaker means retirement from work altogether, and sometimes he means retirement from a particular job or work with a particular employer. These meanings are not always the same. In response to a questionnaire (11) sent to all persons receiving annuity payments from the Teachers Insurance and Annuity Association of America, a majority of those who replied stated that they had received some remuneration for personal services in the preceding year. Likewise, studies of retired Y.M.C.A. secretaries (3, 8) show that most of them are employed after retirement from their jobs. Thus, retirement from a particular job in accordance with a pension plan does not necessarily remove the worker from the labor force. In fact, companies more readily employ a person who has an adequate pension. They hesitate to employ an elderly person without a pension for fear of embarrassment in retiring him without an adequate income. It is well to keep this dual meaning of retirement in mind in considering any discussion of compulsory retirement provisions.

Our analysis is further complicated by the point of view we take in approaching the question. A doctor will look at retirement from the standpoint of the health of the individual. A sociologist will look at it from the standpoint of the welfare of society as a whole. A business executive will look at it from the standpoint of the welfare of the employing organization. A pitcher on a major league baseball team in considering his retirement will think primarily of his personal welfare, whereas his manager will think primarily of the team's welfare.

Our analysis is also complicated by the different attitudes individuals have towards their work. It has been suggested (4) that it would be wise to examine the meaning of work for various people and to use the results of this examination in the formation of policies of retirement and in the preparation of people for retirement. As a result of interviews with a variety of older people Havighurst determined that work may have one or more of the following meanings for people:

1. Pleasure from working with people.
2. Self respect.
3. Respect from others.
4. Means of livelihood.
5. New experience.
6. Chance for creativeness.
7. Means of preventing boredom.
8. Unpleasant necessity.

These eight attitudes are usually found to some degree in every individual who approaches retirement. Usually one or two of them

predominate and certain of them are almost mutually exclusive. The combination of attitudes is likely to determine how a person will like a particular retirement procedure; for example, if a man thinks of his work primarily as a means of earning his bread and butter or as a heavy burden, he will look upon retirement as the happiest moment of his life provided he is economically secure. But if a man thinks of his work as a source of intrinsic enjoyment and as being of tremendous value, he is likely to struggle desperately against retirement.

Attitudes may also change. Otto Pollak (10) stated in his research planning report: "Attitudes may differ in early and in late retirement. Those who resist their retirement at first may learn to enjoy their leisure."

In addition to these complexities, a broad difference of opinion should be noted. Some people assume that it is invariably to a person's best interest to be allowed to work at a decreased tempo until he has squeezed out every last bit of workable energy and he figuratively "drops in the harness." This view is typically American. It is often expressed by persons with great energy who like to work and who scorn idleness—those who do not want to grow old gracefully. It is likely to be the view of those where the first three previously mentioned attitudes predominate.

Other persons believe that old age should be a time of leisure when they will not be required to work to earn a livelihood—when they can engage in creative activities, extensive social service, or just loaf. Many retirement plans have been devised with this latter view in mind, and books (7, 9) have been written to show how to make the most of life after retirement. These differences of opinion regarding the desirability of working in old age reflect both a difference in viewpoint and a difference in attitude of individuals toward their work. Our opinion on this question is likely to affect our ideas regarding the merits of compulsory retirement provisions.

With these preliminaries out of the way, we may now ask why compulsory retirement ages have been inserted in many retirement plans. There seems to be little if any value to a compulsory retirement age *per se*. It is usually accepted as the least objectionable of various alternatives. This view was expressed recently in a report (11) on a study conducted by a joint committee of the American Association of University Professors and the Association of American Colleges. This report states in part:

"Because of the variability in the duration of human effectiveness, the Committee's conclusion that there should be a fixed retirement age was reached with some reluctance and with due appreciation of the fact that the ease of administration had entered into its thinking. However, in a system with a discretionary period, too frequently (1) past services are considered more than present effectiveness, (2) faculty sensibilities are injured, (3) the administration may make prejudiced decisions (and will always be thought to have done so); this allows a possible threat to good tenure practice and hence to academic freedom as well as to faculty morale, (4) faculty members will plan financially for retirement towards the end of the optional period and may often be required to retire earlier with consequent financial and psychological maladjustment, (5) custom will make either the beginning or the end of the optional period usual, hence tending to a fixed retirement age without the clarity of understanding provided by there being such a determination."

While this report was prepared for college teachers, similar reasoning has undoubtedly been applied by those who had the responsibility for establishing state, federal, and private pension plans.

We must not overlook the fact that a man does not retire into a vacuum. If he is a participant in a pension plan, he is normally part of a work team. His retirement will affect the other members of the team and the team as a whole. Those who have the responsibility for establishing pension plans must weigh the pros and cons of each available method for determining when retirement should occur under the pension plan, taking into account the welfare of the employer and the welfare of employees both young and old.

If you had the responsibility for writing a

pension plan, you would have to consider some method for determining when each worker participating in the plan would cease work and start to receive his pension. You could use one of the many types of compulsory age provisions in current use, or you could use one of six other methods sometimes suggested, viz., the retirement age might be determined by:

1. The worker's biologic age
2. A tapering-off process
3. A work-qualification test
4. The worker
5. The employer
6. A committee

It will be observed that the first three involve no discretion, and the last three involve discretion.

Within the limits of this paper, it would not be practicable to discuss all of the advantages of these six methods. As our objective is to explain why they have not been more widely used in the public and private pension plans which have been established, attention will be confined to certain difficulties which may be encountered in trying to fit them into particular pension plans.

1. *Determination by the worker's biologic age.*—Under many retirement plans an employee works at full pay up to the compulsory retirement date when he ceases to work and to receive further pay for his services. If he fails to receive work from another employer, there is a sudden disuse of whatever mental and physical capacities he possesses. Doctors in observing individual cases often note that this sudden cessation of work has an adverse effect on the mental and physical well-being of the worker. Sociologists and economists observe that society loses the productive capacity of a willing and able worker. They therefore urge that retirement be based upon biologic rather than chronologic age.

The argument usually stops at this point. No attempt is made to explain how a provision for retirement in accordance with biologic age could satisfactorily be written into a private or public retirement plan and be administered easily.

The suggestion that retirement under a pension plan occurs in accordance with biologic age presents many practical problems. Although doctors can say unhesitantly that biologically some individuals are older than others and that aging proceeds slowly and inevitably, they cannot prepare a mortality table based on biologic age that has the accuracy needed for a workable pension plan.

In a biologic sense a person's age at one time is a product of many complex factors including not only physical changes but also psychic changes. These various changes are so overlaid with habit patterns and customs that no precise method has been discovered for determining biologic age within the degree of accuracy needed for calculating annuity premiums and retirement benefits. Thus, while the concept of biologic age is valuable for medical studies, the lack of recognized standard tests for determining a person's precise biologic age at any one time limits the use of this concept in pension planning.

Not only is it difficult to determine a man's precise biologic age at any one time, but it is even more difficult to determine in advance how much a person's biologic age will change over a fixed chronologic period. Therefore, the employer whose budgeting, accounting and planning is on a chronologic basis would be faced with added uncertainties caused by the difference between biologic age and chronologic business plans.

There are many advantages to an employer in knowing when a worker will be retired, and there are also many advantages to an employee in knowing definitely in advance how long he has to plan for his retirement. He should know how long to plan for his housing—how long to arrange for accumulating his savings for retirement, etc. It has been demonstrated again and again that very few people will of their own volition adequately budget their income to prepare for their retirement. The average individual is overoptimistic as to his working

lifetime and, if left to his own devices, is ill-prepared for retirement when he is biologically ready for it. In other words, much of both the employer's and the employee's planning is necessarily done on a chronologic basis.

Thus it is apparent that while there are good theoretic reasons for suggesting that the intensity of a man's business activities be regulated by his biologic age, there are many practical difficulties to be overcome in attempting to design a pension plan based on biologic age.

Although some individuals are frequently retired on the advice of a doctor, the writer knows of no instance in which biologic age is the test for retirement and benefits under a pension plan.

2. *Determination by a tapering-off process.* —Although the tapering-off process can refer to one reduction in work, say to one-half of the usual work load, the expression generally refers to a series of changes in the work load starting before and continuing after the normal compulsory retirement age. A typical example might be as follows:

At Age	*Reduce Work & Pay to*
55	90%
60	80%
65	60%
70	40%
75	0%

The tapering-off process is frequently applied outside of regular pension plans by housewives, doctors, lawyers, and owners of small businesses, where it is practicable to let up gradually on the usual business activity. It is also followed in many industries where it is practicable to assign successively lighter duties to workers as they grow older. But the tapering-off process apparently has its limitations. It has seldom been incorporated as part of a pension plan.

Proponents of the tapering-off process usually make certain assumptions without attempting to determine their soundness. One assumption is that salary and work can be reduced proportionately. This assumption in turn depends upon the assumption that there are satisfactory yardsticks for measuring the quality of performance by different elderly workers. While this might be feasible if the workers are doing piecework and for certain types of common labor where the salary relates closely to work units, or where the worker changes to an easier job, there is no such satisfactory test for supervisory personnel, for many workers, and for most persons performing administrative and professional services. In the absence of a sound test that is recognized and fair, the dread fear of discrimination enters the picture. There is no doubt that workers and employers alike abhor a pension plan where discrimination may enter the individual decisions as to when retirement should occur.

A second assumption is that it would be more humane to reduce income gradually than to make one drastic change. It is doubtful whether this assumption is always justified. Employees in a company with a tapering-off system coupled with pension benefits purchased from a percentage of salary would presumably have a smaller retirement income when they reach 65 years of age, and prior to that date might well envy employees in a company permitting workers to earn larger salaries to age 65.

Employees have been known to fight furiously for seniority or tenure rules having no relation to their ability. Moreover, many people have the well-known tendency to "keep up with the Joneses" so that if twin brothers were working for employers having, respectively, the standard retirement plan and a tapering-off plan, the employee under the latter plan would be tempted to make untimely expenditures.

Even if work and salary can be tapered off together, it may not be possible to reduce living expenses in the same way. Certain expenses such as rent, transportation to work, clothing, and food do not adjust downward easily when the employee continues in the same business

with the same employer. Nevertheless, a failure to adjust may cause genuine unhappiness.

Except possibly where the job is changed, the tapering-off process would also cause some unhappiness because the reduction in pay would be a constant reminder to the worker that he is not as good as he was. Being constantly reminded that he was becoming less qualified as his salary went down would have a tendency to make him overconscious of his physical and mental ailments; he would tend to lose confidence. Any employer knows that an unconfident and unhappy worker is not a good worker.

A third assumption is that the worker and his employer will easily agree on what work is to be dropped and what work is to be continued. But the worker may prefer one part of his work and his employer may prefer that he continue another part. For example, a person who is a part-time foreman and a part-time worker may want to continue his duties as foreman, whereas the employer may prefer that he continue his duties as a worker. The more complicated the worker's job, the more difficult it would be to agree upon the part of his work to be reduced.

It is probably because of these difficulties that the tapering-off method has seldom been used in pension plans. While these difficulties would not apply to some employer-employee relationships, they should all be weighed in the balance in determining the relative advantages and disadvantages of a tapering-off process if it were incorporated in a particular pension plan. Henry James, who made a study of the tapering-off process in college retirement plans (6), reported one instance at Lehigh University where a two-stage tapering-off plan between ages 65 and 70 worked well, but he also reported that an administrator from the University of Iowa said "Our experience for the last 18 years has led us to believe that there is nothing good to be said about the tapering-off process; it has created quite a social and financial problem."

Carlson (1) stated in part as follows:

> "One element in the philosophy of organized or union labor, namely, equal hourly wage for all workers in each special trade, must share part of the blame for the past practice of discarding the older worker by the management of industry. Even though all workers are not equal in skill and efficiency, and in spite of the fact that the practice of organized labor tends to gear the rate of all workers to the slowest in the group, there comes a day when the older worker in many given tasks cannot keep pace even with the slowest and least efficient younger comrades. Economic management calls for dismissal of the older worker at that point. If wage in proportion to performance was permitted, the older worker could taper off in industry, just as the young apprentice works himself gradually up in skill, performance, and remuneration."

3. *Determination by a work-qualification test.*—This method assumes that discretion will not be used but that standard tests can be devised which accurately determine when a man should be retired. Like those who favor the biologic age method, its proponents think that retirement should occur when a man loses his ability to perform rather than when he reaches an arbitrary age. It is assumed that accurate and unbiased tests are available. Unfortunately this is seldom true.

A major league baseball player may retire for the good of the team when statistics show that he does not measure up to recognized standards. Here the test is definite, but the difference in performance varies so widely among the players that pension plans have not been used. A pilot on a major airline is retired and may receive a pension when he fails to meet certain rigid tests designed for the safety of the passengers and crew. In this instance, although the tests may not be accurate, their deficiency yields to the welfare of the public. It would seem possible to design qualification tests that are sufficiently accurate and unbiased for practical use in some occupations, but this method has been resorted to in a very small proportion of formal pension plans now in existence.

Thus the three methods—biologic age, the tapering-off process, and a qualification test—where no discretion enters into the determina-

tion of the time of retirement—have all presented difficulties preventing their wide acceptance in pension plans. Let us now turn our attention to methods depending upon the exercise of discretion.

4. *Determination by the worker.*—Under this method it is generally assumed that the employee will maintain a minimum standard of work. Obviously, the employer must retain the right to retire the worker if his efficiency drops below a minimum standard. As explained above, in the absence of specific qualifying tests this is an assumption that may lead an employer to be dissatisfied. It is frequently difficult for an employer to "prove" that an employee is not performing up to normal expectations, especially where the labor union sides with the employee against the employer.

To a certain extent this method provides for a combination of options by the employer and the employee. The employee has the option to determine when he will retire provided he keeps his work up to a minimum standard. Obviously, under any employment the employer must retain the right to retire the worker if his efficiency drops below this minimum standard.

This method presents serious difficulties for the employer in many types of business. It is a common failing of human nature to underestimate our weaknesses and overestimate our capabilities. Thus, even though the employer may be convinced that an employee is not meeting the minimum standard required for the work, the employee may in good faith think he is meeting the standard. The more complicated the type of work, and consequently the harder to establish clear-cut qualification tests, the more unsatisfactory the plan is from the standpoint of the employer.

It is usually assumed that the worker can be relied upon to cease working when necessary to preserve his health. This assumption will not always be justified. At the upper age limit some of the same motives will operate as at the lower age limits where child labor laws have been accepted as salutary even though they prevent some competent children from working at healthful occupations. Many an aged individual has dug a grave for himself by his unselfish desire to help a relative or to pay off a debt.

If the employee alone is given the option to determine when he is to retire, his desire to work in spite of physical ailments may embarrass the employer and endanger the other workers. It may embarrass the employer to see an elderly man handling heavy equipment when the employer knows or suspects that the elderly man has a heart condition. It may endanger the other workers because many ailments of later maturity are not revealed by the standard medical checkup. Of course, this problem is also present at younger ages but to a lesser extent, since in old age the incidence of ailments is accelerated. It is for this reason that airplane pilots may be retired at some specified age regardless of the failure of the doctor to find a physical weakness.

Where the employee has the option to determine when he will retire, the interest of the other members of the work team usually suffers. It is a fact accepted by a considerable number of those responsible for administering organizations and institutions that if the employee can determine the time of his retirement, the efficiency of the organization will deteriorate. In many organizations, before pension plans were adopted, an employee was allowed to work until he obviously became incompetent. Largely because of the conviction that the working efficiency of the organization had deteriorated, thousands of pension plans have been adopted. No enterprising and promising young man wants to join or stay with a firm when he knows that there will be little room at the top for his advancement within the foreseeable future. Pension plans, therefore, have been adopted as the least objectionable method of cutting out some of the dead wood at the top and encouraging new growth at the bottom.

5. *Determination by the employer.*—Before the inauguration of many retirement plans, the usual practice was for the employer to determine when the employment of a worker should cease. Therefore, when retirement plans were adopted it was sometimes thought that the former provision should be incorporated in the retirement plan. Thus, under some pension plans retirement may be forced by the employer at any time, and under other plans employment may be forced by the employer in his discretion after a specified normal age.

While these plans are frequently satisfactory from the standpoint of the employer and from the standpoint of the efficiency of the organization, they are usually not satisfactory from the standpoint of the employees. In any organization where the employer has the option in determining when a man should retire, the employer is put in the position of having absolute powers over a subject of vital concern to the employees. No man likes to be put in the position of having his employer determine his future welfare in this way.

Workers resent and fear caprice and discrimination. This resentment and fear tend to cause talk about discrimination and to stir up jealousies. Retirement invariably causes an individual being retired to compare himself with other employees. Frequently he does not know all the circumstances. He usually underestimates his failings. Almost always he will think he has been treated unfairly.

A plan whereby the employer has the option to determine when a worker retires also tends to destroy the individual's feeling that he has security in his job. It runs counter to the efforts to establish seniority rules in union agreements and tenure arrangements by teachers and professional people. This tendency of the individual to want definite security as to his future is gaining ground rather than losing ground in the United States.

6. *Determination by a committee.*—If the decision as to when a person should retire is exercised by an unbiased board, commission or committee, many but not all of the objections to deciding the matter of the option of the employee or employer are eliminated. This method has been used successfully by the United States Army for retiring officers. But the method has not come into wide use—possibly because of the difficulty of collecting a group that is truly unbiased. In the typical business or industry, it is difficult to select a group of men which is completely neutral and would not be accused of favoring either the employer or employee.

Many plans provide for retirement after a specified normal age by the action of the board of directors. Presumably, such a board is unbiased, but most workers are likely to think that the board of directors is more interested in problems of management than in problems of the individual. Furthermore, boards of directors often have difficulty in dealing with the problem of retiring top executives who are in a position to exert influence on the members of the board. Moreover, since directors know only a few employees, their decision is likely to be based upon the opinion of someone else; for example, the president who presents the matter to them for consideration.

Sometimes this method is used in conjunction with a provision for compulsory retirement at a maximum age to determine when a man should be retired before reaching the maximum age. But in spite of its apparent advantages over decisions by the employer or employee alone, the committee method has been used in comparatively few retirement plans. Unless such a board or committee adopts fairly standardized tests in making its decisions, it will be costly because of the time which will be required to reach a decision.

Summary

The desirability of a specified age for compulsory retirement under a pension plan is often the subject of controversy. Certain objections to such plans are obvious; viz., persons are sometimes required to cease working when they are still mentally and physically competent, and when they want to continue to work. They

are "consigned to the scrap heap" at age 65 or 70. The result is to embitter them, undermine their health, and deprive society of the benefits of their services.

In spite of these obvious shortcomings, nearly all public and private retirement plans have adopted a compulsory retirement age as being less objectionable than other available alternatives. In considering such plans, therefore, we should examine but not confine ourselves to their apparent weaknesses. We should also examine the drawbacks of the other methods which have been suggested for determining when retirement should occur to see if they have less objectionable weaknesses. In studying the plans we should weigh all of the complex and diverse interests involved, including the efficiency of the work team as a whole and the welfare of the retiring members.

Life is so complicated and jobs are so different that there is probably no universal solution for all situations. After examining the pros and cons of all methods, we will probably decide, as nearly all pension committees have, that a compulsory retirement age is the least objectionable of the available methods, and we will therefore recommend it even though we know of its patent weaknesses. A compulsory retirement age is often a practical norm in the same sense as the minimum age in the child labor laws, equal hourly wages by a corporation in all sections of the country, seniority rules, and tenure.

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CURRENT COMMENT

University of Michigan Conference on Aging

The University of Michigan announces its Fourth Annual Conference on Aging to be held in Ann Arbor, July 11 to 13, 1951. Rehabilitation of the older handicapped person will be the topic of this year's conference, with special emphasis upon the theme that "All Are Needed." American and foreign authorities will be available to discuss the questions raised by the working conference. Attention will be directed to medical, psycho-social, economic, and vocational aspects of retaining the over-40 workers in the labor force and the role of these workers with reference to mobilization. Exhibits on the preventive and restorative phases of rehabilitation are planned.

The conference is under the co-sponsorship of the Institute for Human Adjustment, School of Medicine, School of Public Health, and Extension Service of the University of Michigan, the Office of Vocational Rehabilitation of the Federal Security Agency, and the Michigan Department of Vocational Rehabilitation.

Room reservations should be made by writing directly to the Michigan Union, Ann Arbor. Further information regarding the conference may be obtained from Dr. Wilma Donahue, Institute for Human Adjustment, Room 1510, Rackham Building, Ann Arbor, Michigan.

Making the Most of Maturity

Professional persons, 55 to 64 years of age, will be interested in a special program of study to be offered this summer by the Committee on Human Development of the University of Chicago. This program, Making the Most of Maturity, will consist of individual consultation, discussion, and study organized around a series of lectures and films. Topics to be included will be health, nutrition, employment, financial planning, the use of leisure time, participation in social and community life, spiritual life, and a philosophy for the middle and later years.

The course will be given July 9 through August 3. The fee will be $75.00. Living quarters for out-of-town participants are available at a moderate charge in University residence halls. Interested persons should write to Mrs. Mary Hollis Little, Executive Secretary, Making the Most of Maturity, University of Chicago, Chicago 37, Illinois.

Adult Education Workshop on Gerontology

The Adult Education Workshop on Gerontology will be offered for the two-week period beginning July 16 at Chautauqua by the School of Education of New York University. The co-educators of the Workshop will be Pro-

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The hieroglyphics, "The Beginning of the Book for Transforming an Old Man into a Youth," at the top of this editorial page, are from the Edwin Smith Surgical Papyrus, translated by Professor John Breasted, University of Chicago Press.

fessor John Carr Duff of New York University and Dr. Wilma Donahue of the University of Michigan. Among the consultants will be Dr. Karl Menninger of Topeka, Kansas, Dr. Clark Tibbitts of the Federal Security Agency, Washington, D. C., and Mrs. Henrietta Rabe, of the State Education Department, Albany, New York.

Further information on the courses for the Workshop, offered under the title of "Living in the Later Years," may be obtained from Professor John Carr Duff, Chairman, Department of Adult Education, School of Education, New York University, New York 3, New York.

News and Notes

The Rectoría de la Universidad Nacional Autónoma de México, the Dirección de la Escuela Nacional de Medicina, and the Sociedad Mexicana de Geriatría are sponsoring a series of conferences on geriatrics in the Auditorium of the Escuela Nacional de Medicina, México, D. F., on Saturdays from April 7 to November 24, 1951, under the direction of Dr. Manuel Payno, Jr. Dr. Payno is also President of the Sociedad Mexicana de Geriatría.

The Sociedad Nuevoleonesa de Gerontología y Geriatría was founded in Monterrey, N. L., México, February 6, 1951, with the purpose of promoting the study of these scientific disciplines in the city of Monterrey. The officers are: Dr. Eduardo Aguirre Pequeño, President, Dr. Enrique C. Livas, Vice-President, Dr. Rafael Salinas Rivero, Secretary, and Dr. Raúl E. González, Treasurer.

A grant of $60,000 has been made by the Commonwealth Fund to the Hunterdon County (New Jersey) Medical Center for a special study of chronic disease prevalence in the United States and of the facilities and services which are needed. The study will be based on plans developed by the Commission on Chronic Illness and will be carried out by the Hunterdon Medical Center under the direction of Dr. Ray E. Trussell, Medical Center Director, with consultation from the Commission staff.

The Welfare Council of New York City (44 East 23 Street, New York 10, New York) has recently published a new edition of their *Directory of Recreation Facilities for Older People*. This directory lists some fifty recreational centers which sponsor special programs for older people. Information with regard to the groups served, the time of meeting, fees, bath facilities available, transportation, and programs is given for each of the centers.

Some of the centers have programs daily, Monday through Friday from 9 a. m. to 5 p. m., and are able to serve groups of 200 to 300 people; whereas others hold only weekly or monthly programs for small groups of 25 to 50. There are also specialized groups for the blind and hard-of-hearing. Most of the centers charge no fee.

The fourth Connecticut Post-graduate Seminar in neurology, psychiatry, and related fields of medicine, sponsored by the joint committee of state mental hospitals in the Department of Psychiatry and Mental Hygiene, Yale University School of Medicine, devoted a series of five seminars in their spring semester to geriatric psychiatry. The program for this series was under the supervision of Dr. Philip J. Moorad, New Britain Memorial Hospital, New Britain, Connecticut.

Each session consisted of two lectures, the first dealing with the broad aspects of the problem and the second dealing with the clinical problems of an aging population. Lectures were followed by round table conferences. The areas covered in the five sessions March 7 to April 4 included demography of the aged, the biology of aging, psychology of old age, mental

hygiene of the aged, and the role of the state psychiatric hospitals in the problems of the aged. Speakers in the series included Drs. Benjamin Malzburg, N. W. Shock, Frederic D. Zeman, George Lawton, David Rothschild, Robert H. Felix, Michael Dasco, Ronald H. Kettle, and A. Newell Creadick.

A two-day conference on Society and the Older Citizens, April 27 and 28, 1951, was presented by the Division of General Education of New York University, New York. The first day was devoted to a presentation of the facts that underlie and create the problem. The morning of the second day was taken up with six panel meetings for the formulation of proposals for action. At the afternoon session the proposals for action were reported to the membership of the conference and submitted for adoption as recommendations of the conference.

The University of Florida Committee on Gerontology held a Southern Conference on Gerontology March 19-20, 1951, at Gainesville, Florida. The purpose of the Conference was to define the problems needing research. Discussion leaders and speakers at the Conference included: Dr. Warren S. Thompson, Dr. T. Lynn Smith, Dr. N. W. Shock, Dr. Wilma T. Donahue, Frank G. Dickinson, and Irving L. Webber.

In addition to the papers presented round-table discussions were also held. Plans for another Conference to be held in 1952 were announced.

The annual meeting of the American Society for the Study of Arteriosclerosis will be held in Chicago, Illinois, November 4-5, 1951. A total of 31 papers will be presented. Information regarding the meeting may be obtained from Dr. O. J. Pollak, Secretary-Treasurer of the Society, Quincy City Hospital, Quincy 69, Massachusetts.

The Second European Congress of Rheumatology will be held in Barcelona, Spain, September 24-27, inclusive. Registration will close August 15.

The Seventy-Ninth Meeting of the American Public Health Association, the Eighteenth Annual Meeting of its Western Branch, and the annual meetings of 38 related organizations will be held simultaneously in San Francisco, October 29 to November 2, 1951. The combined meetings are expected to bring together 5,000 health specialists from all parts of the Western Hemisphere.

A Conference on the Problems of Older Workers, sponsored by the Industrial Relations Center of the University of Wisconsin, was held in Madison, June 1 and 2, 1951. The Conference, organized by Mr. R. W. Fleming of the Industrial Relations Center, consisted of a series of round table discussions. The problems considered included the following: The Employability of Older Workers, led by N. W. Shock and A. Abrams; Experiences with Older Workers, led by E. Breckenridge, T. Swain, and C. Elliot; The Pros and Cons of Compulsory Retirement, led by J. W. McConnell, A. Nielsen, and W. Burke.

Notice to Members of the Gerontological Society, Inc.

Inasmuch as the annual meeting of the Gerontological Society is to be held concurrently with the Second International Gerontological Congress, special arrangements have been made for registration of members of the Society. Your dues will cover a part of the registration fee. A copy of the program will be mailed to you and should be brought to the Congress since another cannot be furnished.

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GERONTOLOGY IN THE UNITED KINGDOM

The aim of this paper is to outline the present status of gerontology in the U.K. and at the same time to give as much information as possible about the source from which a detailed knowledge of any special gerontologic item reported may be obtained. This scheme, in spite of the necessary economy of space, permits presentation of the material in a way which will facilitate its utilization by interested scientific and medical circles.

It must be emphasised, however, that this survey is only a personal interpretation of the present situation. Some necessary information was difficult to collect, and the review cannot be considered complete, or even without some inaccuracies, for the following reasons.

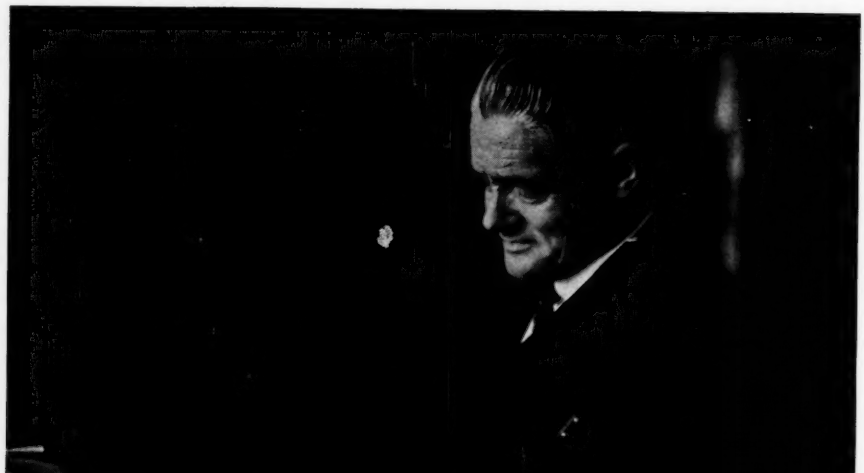
Active interest in the problems of old age was awakened in the U.K. only within the last few years. Accordingly, most gerontologic ventures are still in a tentative and fluid state. Their chief aim at present is to find the best plans of organisation and the ways and means of financing their activities. They are so far not united by any central body nor by national conferences at which all of them could be represented and could work in cooperative efforts towards a solution of the problems of aging.

In spite of this in many branches of gerontology there are already persons and organisations working enthusiastically and effectively. Many good beginnings have been made, and there is good will in official, scientific, medical, and public circles. There is no doubt that, in spite of numerous great organising and financial difficulties, work on the problems of old age will be carried out in the U.K. as efficiently as the resources of the country will allow. This should be especially appreciated in view of the post-war reconstruction difficulties.

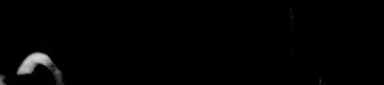
LORD NUFFIELD'S CONTRIBUTION

It was Lord Nuffield who awakened wide and active interest in the problems of old age in this country. When he established the Nuffield Foundation, he stipulated that assistance to old people should be one of the main aims of the Foundation. His action has drawn the attention of the whole country to this vital and tragic problem of humanity and at the same time has provided resources for starting the struggle towards the solution of this problem.

Since the establishment of the Foundation Lord Nuffield has remained closely interested in its activity, giving his advice when required, and in addition extending privately further financial help to some gerontologic ventures in this country. Only because of his grants has the British Society for Research on Ageing been able to carry out its activities not only in the U.K., but in Europe and America as well. In particular he invited, presided over, and financed the Round-table Conference between the Executive Committee of the British Society



I wish the best success to the Journal of Gerontology and to the International Association of Gerontological Societies in their work vitally important for humanity.



for Research on Ageing and the American Delegation to the First International Gerontological Congress.

In these ways, Lord Nuffield has assisted in the development of gerontology on an international scale.

The Nuffield Foundation

Up to the present the Nuffield Foundation (12 Mecklenburg Square, London, W.C. 1) has been active in the following gerontologic ventures. Socio-economic investigation into the circumstances of the lives of old people has been made by the Rowntree Committee, which published the results obtained in an excellent report on the subject (*Old People*. The N.F. Report of a Survey Committee on the Problems of Ageing and the Care of Old People, Oxford University Press, London, 1947). This social survey was followed by an intensive medical survey by Dr. J. H. Sheldon of old people living at home in one of the

towns (Wolverhampton) covered by the Rowntree report (*The Social Medicine of Old Age*, Oxford University Press, London, 1948).

The Foundation established and, for a certain period of time, has guaranteed financial support for the Nuffield Research Unit into Problems of Ageing at the Psychological Laboratory of Cambridge University.

In 1947 the Foundation, in co-operation with the Lord Mayor of London's National Distress Fund, established the National Corporation for the Care of Old People. The Foundation's policy is to give continuing support to the National Corporation and thereby to fulfill the major part of its obligation to the welfare of old people, but it will also give consideration to projects of research into the problems of aging.

Besides these activities the Foundation distributed a few grants to some voluntary organisations and to a small number of gerontologic research schemes, including that of Dr. T. H. Howell, and recently to the Oxford Gerontological Research Unit.

The Foundation publishes annual reports in which its varied and important work is described in detail. At the same time these reports explain those principles and ideas which govern and define the Foundation's activities.

The capital of the Foundation consists of 10 million pounds. Since the "care and comfort of the aged poor" in the words of its trust deed is only one of its three main objects, and gerontologic research only a part of its work, it is clear that financial help from the Foundation is far from sufficient to cover all the gerontologic research schemes in the U.K. or the desirable expansion of such schemes.

Exceptionally large funds are necessary for this research, because it is very difficult and complicated, involving nearly all branches of biology, the whole of medicine, and many aspects of the socio-economic sciences. The author cannot see how this can be achieved without the establishment of a special Foundation for Research on Old Age, a procedure which would be justified by the fact that the problem of aging affects every human being.

Gerontologic Research

British Society for Research on Ageing (address: c/o Dept. of Physiology, Oxford University, Oxford).

In the U.K. the whole movement and organisation of gerontologic research was stimulated and started in 1939 by the British Society for Research on Ageing. At the time it was established by a group of British scientific and medical research workers as an international Club for Research on Ageing.

For the initiators the responsibility of this research and the exceptionally great difficulties made it obvious that only international cooperation could bring about its comparatively rapid progress. Accordingly, the activities of the British Society for Research on Ageing were directed towards this aim.

The work of the Society, interrupted for a period during the war, can be summarised as follows:

1) It has been instrumental in establishing gerontologic societies in European countries, Australia, Canada, Argentina, and the first society in the United States.

2) It was the initiator and organiser, together with the American and Belgian Gerontological Societies, of the First International Gerontological Congress, which was held in Liège, Belgium, July 10-12, 1950, and also of a Round-table Conference between the American delegates of the International Conference and the Executive Committee of the British Society for Research on Ageing, under the Hon. Chairmanship of Lord Nuffield, on July 8, 1950. The chief aim of these two conferences was to organise efficient progress in gerontologic research and close cooperation between gerontologic societies.

3) The Society initiated, did all preliminary work, and, with the other gerontologic societies, established the International Association of Gerontological Societies.

4) It has organised its own annual conferences.

5) It has established two experimental Gerontological Research Units, in Oxford in 1945, and in Edinburgh in 1947.

6) In cooperation with the London County Council it has organised Clinical Trials on the Effects of Vitamins in the Tooting Bec Hospital, London.

7) It took part in the preliminary work of the American Gerontological and Geriatrics Societies in establishing a gerontologic fund or foundation.

8) It has published two editions of lists of all existing gerontologic and geriatric societies (Societies for Research on Old Age, Oxford, 2nd edition, 1949).

All the foregoing activities of the British Society, including the travelling of its Hon. Secretary to foreign countries, were financed by donations from Lord Nuffield. Since 1950 research work in the Oxford Gerontological Research Unit has been financed by the Nuffield Foundation. The Edinburgh Unit, besides two donations from Lord Nuffield, has received grants from Edinburgh University.

Oxford Gerontological Research Unit (1945-1951).—Head of the Unit, Dr. V. Korenchevsky; Research Assistant, Miss S. K. Paris; 3 technical assistants.

The following papers have been published from the Unit or are in print:

Papers published by Dr. Korenchevsky:

1. The Longest Span of Life Based on the Records of Centenarians in England and Wales. *Brit. M. J., ii:* 14-16, 1947.
2, 3. Conditions Desirable for the Rapid Progress of Gerontological Research. *Brit. M. J., ii:* 468, 1946, and *J. Gerontol., 2:* 54-56, 1947.
4. Effects of Sex and Thyroid Hormones on the Process of Ageing in Female Rats. *Brit. M. J., i:* 728-731, 1948.
5. The Problem of Ageing: Basic Difficulties of Research. *Brit. M. J., i:* 66-68, 1949.
6. The Effect of Vitamins on Heart Lesions Produced by Thyroid Hormone in the Rat. *J. Path. & Bact., 62:* 53-60, 1950.
7. L'Organisation Internationale des Recherches sur la Sénéscence. Travaux des Trois Journées pour l'Étude Scientifique du Vieillissement de la Population, *3:* 134-137, 1948. Paris.
8. European Gerontologic Activities. *J. Gerontol., 4:* 314-317, 1949.
9. Ways and Means of Cooperation Between Gerontological Societies in Europe and America. *Conference on Problems of Ageing,* edited by N. W. Shock, Josiah Macy, Jr. Foundation, New York, 1950, 174-185.
10. The Problem of Ageing and Ways and Means for Achieving Rapid Progress of Gerontological Research. In *Social and Biological Challenge of Our Aging Population,* Columbia University Press, New York, 1950, 7-24.
11. Rejuvenative or Eliminative and Preventive Treatment of Senility as Suggested by Experiments on Rats (Proceedings of the First International Gerontological Congress). *Rev. méd. Liège, 5:* 687-689, 1950.
12. Rejuvenative or Preventive and Eliminative Treatment of Senility. *Geriatrics, 5:* 301-310, 1950.
13. Spontaneous Development of Meta-hyperplasias and Adenoma-Like Structures in Senescent Rats. *Acta Union Internat. Contre Cancer,* 1951. In print.
14. Cooperative Effects of the Processes of Ageing and Overstimulation with Hormones in Producing Adenoma-Like Structures and True Adenomas. *Acta Union Internat. Contre Cancer, 7:* 323-329, 1951.

Papers published by Dr. Korenchevsky and Dr. V. Jones:

15, 16, 17. The Effects of Androsterone, Oestradiol, and Thyroid Hormones on the Artificial Premature "Climacteric" of Pure Gonadal Origin Produced by Ovariectomy in Rats. I. Effects on Weights of Organs. *J. Gerontol, 1:* 319-335, 1946. II. Effects on Histologic Structure of Liver and Kidneys. *J. Gerontol, 1:* 336-344, 1946. III. Effects on Histologic Structures of Vagina, Uterus, Adrenals, and Thyroid. *J. Gerontol, 2:* 116-136, 1947.
18. The Effects of Progesterone, Oestradiol, Thyroid Hormone, and Androsterone on the Artificial Premature "Climacteric" of Pure Gonadal Origin Produced by Ovariectomy in Rats. *J. Gerontol, 3:* 21-39, 1948.

Papers published by Dr. Korenchevsky, Miss S. K. Paris, and Mr. B. Benjamin:

19. Treatment of Senescence in Female Rats with Sex and Thyroid Hormones. *J. Gerontol, 5:* 120-157, 1950.

Papers published by Dr. Korenchevsky and Miss Paris:

20. Cooperative Effects of Endocrinological Fac-

tors and Processes of Ageing in Producing Adenoma-Like Structures in Rats. *Cancer, 3:* 903-922, 1950.

21. Effects of Anterior Hypophysis Hormones and Their Action with Some Other Hormones on Ageing Female Rats. *J. Path. & Bact., 63:* 111-131, 1951.

Research in progress: Effects of hormones on male senescent rats and the role of metabolites in processes of aging.

Edinburgh Gerontological Research Unit. Usher Institute, Edinburgh University. (1947-1951).—Director of the Unit, Professor F. A. E. Crew, F. R. S.; Research workers, Dr. E. Geiringer and Mr. D. C. Hardwick (biochemist); 1 technical assistant.

Papers published by Dr. Geiringer:

1. The Gerontological Aspects of Atheroma. *Brit. J. Social Med., 2:* 132, 1948.
2. Arteriosclerosis as a Phenomenon of Pure Ageing. *Arch. Path., 48:* 410-420, 1949.
3. L'Arteriosclerose en tant que Phenomen Propre au Viellissement (Proceedings of the First International Gerontological Congress). *Rev. méd. Liège, 5:* 614-617, 1950.
4. Venous Atheroma. *Arch. Path., 48:* 410-420, 1949.
5. Vitamin C and Achromotrichia. (Proceedings of the First International Gerontological Congress). *Rev. méd. Liège, 5:* 664-666, 1950.

Research in progress: Changes of histamine metabolism with age.

Scottish Branch of the British Society for Research on Ageing (Chairman, Prof. F. A. E. Crew, Usher Institute, Warrender Park Road, Edinburgh).—The Branch was established and organised by Prof. Crew in 1947 to stimulate and unite gerontologic and geriatric activities in Scotland and its work awakened interest in the problems of aging in this part of the U.K. In consequence, the Edinburgh Gerontological Research Unit was established and cooperative geriatric research in Edinburgh was organised by the Medical Department of the University, the Biochemical Department of the Royal Infirmary, and the Geriatric Unit of Queensbury House Hospital. The papers published will be given later when describing the research activity of Dr. Olbrich.

The Nuffield Research Unit into Problems of Ageing (1946-1951)—(Hon. Director Professor, Sir Frederick Bartlett; Director, Dr. A. T. Welford. Department of Psychology, Cambridge University).—This Unit was established by the Nuffield Foundation in 1946 for psychologic gerontologic research, in particular for the investigation into how middle-aged and older people in industry can be helped to maintain their efficiency and thereby their self-respect. This practical aim, however, does not overshadow the fact that results of lasting value will be obtained towards the solution of the general problem of human skill in relation to age.

The scientific activity of the Cambridge Unit is demonstrated by the following publications:

Papers published by A. T. Welford:

1. Age and Skill. *The Nineteenth Century and After, 148:* 98-105, 1950.
2. Problems of Old Age. Skill and Age. *Advancement of Science, 6:* 20-21, 1949.
3. *Preliminary Investigations of Differences in Skilled Performance Associated with Different Age Groups.* (Proceedings of Twelfth International Congress of Psychology, Edinburgh, 1948).
4. *Skill and Age. An Experimental Approach.* Oxford University Press, London, 1951. (In press).

Papers published by J. Szafran and A. T. Welford:

5. On the Problem of Generalized Occupational Transfer Effects in Relation to Studies of Ageing. *Quart. J. Exper. Psychol., 1:* 160-166, 1949.
6. On the Relation Between Transfer and Difficulty of Initial Task. *Quart. J. Exper. Psychol,. 2:* 88-94, 1950.

Paper by A. T. Welford, Ruth A. Brown, and J. E. Gabb:

7. Two Experiments on Fatigue as Affecting Skilled Performance in Civilian Air Crew. *Brit. J. Psychol., 40:* 195-211, 1950.

Paper by A. T. Welford and D. Speakman:

8. The Employability of Older People, in *The Aged and the Society.* Industrial Relations Committee, Champaign, Illinois, 1951, 181-203.

Research in the Department of Pathology, University College Medical School, London. (Director, Professor G. R. Cameron, M. D., F. R. S.)

Published papers:

1. F. A. Denz: Age Changes in Lymph Nodes. *J. Path. & Bact., 59:* 575-591, 1947.
2. R. H. D. Short: Alveolar Epithelium in Relation to Growth of the Lung. *Phil. Trans. Royal Soc. Med., B., London, 235:* 35-86, 1950.
3. A. H. Sheik: *Thrombo-Angiitis Obliterans and Allied Conditions.* University of London Thesis, 1950.

Research in the Department of Pathology, Durham University, Newcastle-on-Tyne. (Director, Professor J. B. Duguid, M. D.)

Papers published by Dr. Duguid:

1. Pathogenesis of Arteriosclerosis. *Lancet, 257:* 925-927, 1949.
2. Pathogeny of Arteriosclerosis. (Proceedings First International Gerontological Conference). *Rev. méd. Liège, 5:* 618-619, 1950.

Research of Professor J. Trueta. Dr. J. Trueta is Nuffield Professor of Oxford University. In his clinic in the Wingfield-Morris Hospital, Oxford, and, with his associates at the Royal Veterinary College, London, Dr. Trueta is engaged in research on the relation of hypertension to kidney circulation and also on the influence of the redistribution of the blood in bone in health and in disease at ages ranging from birth to senility. The experiments are performed on dogs and rabbits. With his associates at the Nuffield Orthopaedic Centre, Oxford, he is also studying changes in blood circulation and some other changes in osteoarthritis of the hip, a disease of old age.

Published papers:

1. The Relation of Hypertension to the Renal Circulation. *Glasgow M. J., 31:* 217-242, 1950.
2. Kidney. *Ann. Rev. Physiol.,* 369-398, 1950.
3. Experimental Studies of the Renal Circulation in Hypertension. Proceedings of VII International Congress of Surgery in Buenos Aires, 1950. In print.

Research in Progress

In the following laboratories gerontologic research is in progress:

Laboratory of Organic Chemistry, Oxford University. (Director, Professor Sir Robert Robinson, F. R. S.)

Research in progress: General chemical work on steroids which eventually might be of interest to gerontology.

Lady Robinson: Synthetic and natural growth factors.

Neuropsychiatric Research Centre, Whitchurch Hospital, Cardiff. (Director, Dr. D. Richter).

Effects of aging on biochemical systems in the brain.

National Institute for Research in Dairying, Reading University, Shinfield. (Director, Professor H. D. Kay, F. R. S.)

Dr. S. J. Folley: Dynamics of mammary growth in the rat in relation to age.

Department of Pathology, British Postgraduate Medical School, London. (Director, Professor J. H. Dible).

Research in progress: Condition of the peripheral vascular system in the aged.

Department of Zoology, Birmingham University. (Director, Professor P. B. Medawar).

Genetical theory of ageing.

Department of Zoology, Glasgow University. (Director, Professor C. M. Yonge, F. R. S.)

Dr. Vera Warrender: Changes of the phagocytic function of the reticulo-endothelial system with aging in mice.

Department of Medicine, Birmingham University. (Director, Professor A. P. Thomson, M.D.)

Response of the aged to stress.

Geriatric Research Work

With the exception of the Leeds geriatric research centre, the other geriatric research headquarters have moved from one hospital to another with the doctors who have initiated them and who are personally carrying out research work. This was so in the cases of Dr. Howell, Dr. Olbrich, and Dr. Cosin.

Geriatric Committee of the Royal Medico-Psychological Association.—This Committee was established in 1951 with the aim to serve, partly by promoting research and partly in an advisory capacity, on the problems related to the mental health of old people, in particular on

those problems which are referred by official bodies to the Association. Information may be obtained from Dr. D. Richter, Whitchurch Hospital, Cardiff.

Medical Society for the Care of the Elderly. (St. John's Hospital, London, S.W. 11).—This Society was established in 1947, chiefly due to the initiative and energy of Dr. T. H. Howell, who is its Hon. Secretary. The aims of the Society are to improve the standards of medical care for elderly patients, to hold meetings, and to encourage research on old age. Only registered medical practitioners can become members of the Society.

Leeds Geriatric Unit.—Research work in the Unit is carried out and directed by Dr. H. Droller, under the supervision of Prof. R. E. Tunbridge of Leeds University. At present the Unit is actively engaged in studying aging changes in connective tissue, in particular collagen and fibres. Other details are given in table 1. The following papers have been published from the Unit:

1. R. Reed, R. N. Tattersall, and A. Millard: An Electron-Microscopic Study of Senile Skin Changes (Proceedings International Conference on Electron-Microscopy.) 1950. Delft.
2. R. N. Tattersall, and R. H. Seville: Senile Purpura. *Quart. J. Med. 19:* 151-159, 1950.
3. Tunbridge, R. E., Astrury, W. T., Tattersall, R. N., Reed, R., Eaves, G., and Hall, D. A.: Observations on the Nature of the Changes in Senile Skin (Proceedings, First International Gerontological Conference). *Rev. méd. Liège, 5:* 671-673, 1950.

Units of St. John's Hospital and Medical Mission Hospital.—Dr. T. H. Howell, the director of these Units, started his investigations of various clinical symptoms of old age in the Royal Chelsea Hospital, London. Later he became lecturer in problems of old age at St. Bartholomew's Hospital. Now he is both lecturing and doing research work at the Geriatric Units of St. John's Hospital and the Medical Mission Hospital, London. Dr. Howell has published the following papers:

1. Arterial Thickening in Old Age. *Brit. Heart J., 7:* 135-138, 1945.
2. The Royal Hospital, Chelsea. *J. Gerontol., 2:* 321-326, 1947.
3. The Kidney in Old Age. *J. Gerontol., 3:* 124-128, 1948.
4. Normal Temperature in Old Age. *Lancet, 254:* 517-518, 1948.
5. The Pulse Rate in Old Age. *J. Gerontol., 3:* 272-275, 1948.
6. Case Report on Cardiac Rupture during Rehabilitation. *Brit. J. Phys. Med., 12:* 152-154, 1949.
7. The A.B.C. of Geriatrics. *Practitioner, 163:* 67-69, 1949.
8. Relief of Pain in Rheumatoid Arthritis with Tetraaethyl Ammonium Bromide. *Lancet, 258:* 204-206, 1950.
9. A Simple Treatment for Fibrositis. *Med. Press, 173:* 514, 1950.
10. Rheumatic Pains. *St. Barth. Hosp. J. 54:* 122-124, 1950.
11. The Appearance of the Myocardium in Old Age. *Geriatrics, 5:* 90-92, 1950.
12. *Old Age.,* 2nd Edition. H. K. Lewis and Co., London, 1950.
13. Treatment of Fibrositis with Adrenaline, Ephedrine and Belladonna Creams. *Lancet, 259:* 395-397, 1950.

West Middlesex Hospital.—Dr. Marjory W. Warren is the Director of the Geriatric Unit in this large hospital (Isleworth, Middlesex). She is engaged in investigations of the problems of the care of the elderly, in particular of their clinical conditions and allied social problems. Dr. Warren also conducts courses in the Hospital for doctors and nurses on postgraduate geriatric education. Papers published by Dr. Warren:

1. Care of the Chronic Sick. *Brit. M. J., ii:* 822, 1943.
2. Geriatrics; Care of Old Sick People. *Nursing Mirror, 80:* 47-48, 1944.
3. Care of the Chronic Aged Sick. *Lancet, i:* 841, 1946.
4. Geriatrics: A Medical, Social and Economic Problem. *Practitioner, 157:* 384-390, 1946.
5. Care of the Chronic Sick. *Brit. J. Phys. Med., 10:* 34-42, 1947.
6. A New Outlook on the Care and Treatment of the Elderly. *Nursing Times, 43:* 5440-5446, 1947.
7. The Evolution of a Geriatric Unit. *Geriatrics, 3:* 42-50, 1948.
8. The Evolution of a Geriatric Unit from a Public Assistance Institution, 1935-1947. *Proc.*

Roy. Soc. Med. London, 41: 337-338, 1948.
9. Care of the Hemiplegic Patient. *Med. Press, 219:* 396-398, 1948.
10. Physical Medicine in Geriatrics. *Brit. J. Phys. Med., 11:* 167-168, 1948.
11. Facilities Available for the Care of the Elderly. *Practitioner, 165:* 156-163, 1950.
12. Activity in Advancing Years. *Brit. Med. J., ii:* 921, 1950.

Units of Queensbury House Hospital and Sunderland General Hospital.—Dr. O. Olbrich started his research, in cooperation with Edinburgh research workers, in the Queensbury House Hospital, Edinburgh. Recently he became Director of the Geriatric Unit of the General Hospital in Sunderland. He has published the following papers:

1. Nitrogen Balance in Chronic Kidney Disease *Edinburgh M. J., 51:* 327-334, 1944.
2, 3, 4. Blood Changes in the Aged. *Edinburgh M. J., 54:* 306-321, 1947; *54:* 649-656, 1947; *55:*100-115 1948.

In colloboration with Drs. J. S. Robson, M. Ferguson, and C. P. Stewart (from the Dept. of Medicine of Edinburgh University and the Biochemical Dept. of the Royal Infirmary, Edinburgh) Dr. Olbrich has published the following papers:

5. The Determination of the Renal Clearance of Inulin in Man. *Quart. J. Exper. Physiol., 35:* 111-134, 1949.
6. The Determination of the Renal Clearance of Diodone and the Maximal Tubular Excretory Capacity for Diodone in Man. *Quart. J. Exper. Physiol., 35:* 173-203, 1949.
7. The Use of Inulin Clearance as a Measure of Glomerular Filtration. *Quart. J. Exper. Physiol., 35:* 251-279, 1950.
8. Renal Function in Aged Subjects. *Edinburgh M. J., 58:* 117-127, 1950.
9. A Comparison of the Continuous Infusion and Single Intravenous Injection Methods of Determining Discrete Renal Functions. *Edinburgh M. J., 58:* 110-116, 1950.

Units of Orsett Hospital and Cowley Road Hospital.—Dr. L. Cosin started his geriatric research in Orsett Hospital in Essex, then moved to Langthorne Hospital, London, and at present he is Director of the Cowley Road Hospital, Oxford, where he is organising a geriatric unit. He has published the following papers:

1. Modern Methods in the Care of the Aged. *J. Roy. Inst. Pub. Health & Hyg., 11:* 122-135, 1948.
2. The Psychological Significance of Geriatric Rehabilitation. *J. Roy. Inst. Pub. Health & Hyg., 12:* 187-194, 1949.
3. Some Observations upon the Radiology of the Small Intestine in Old Age. *Brit. J. Radiol., 22:* 325-330, 1949.

The Care of the Aged

Pensions.—The standard rate of pensions is £1. 6. 0. a week for a man at 65 and an insured woman at 60 who have paid prescribed insurance contributions. If, after the age of 65 (or 60 for a woman), a person continues to work and pay insurance contributions, then the amount of the pension awarded at retirement is increased according to the number of contributions paid after minimum pension age; the maximum pension is £1. 16. 0.

A married woman who is not insurably employed is entitled to a pension by virtue of her husband's insurance contributions. The standard rate is 16/- weekly, and she becomes entitled to this at age 60 or later. The amount of pension drawn by a man is increased by 16/-, if he has a dependent wife under the age of 60, and by a further 7/6d. weekly if he has a dependent child.

Persons who do not qualify for a contributory pension may be awarded a noncontributory pension of up to £1. 6. 0. weekly from age 70 onwards by the National Assistance Board, subject to a test as to need.

All of these pensions can be, and frequently are, supplemented by weekly grants based on need, assessed and paid by the National Assistance Board.

Other Measures.—A good review of the problem of the care of the aged and the steps already taken towards its solution was given at the meeting of the Royal Sanitary Institute held October 11, 1950, in London, by Drs. G. Hughes, G. S. Wigley, Sir Edward Bligh, and

F. R. O'Shiel (*J. Roy. San. Inst., 71:* 36-56, 1951).

Sir Edward Bligh divides the organisation of welfare care for the old people in the U.K. into five general sections:

1. The vast majority of healthy active old people who manage their own affairs and needs, provided they have sufficient money. This group does not need special welfare services.

2. Old people who need assistance and provision with one or more of the following welfare services: suitable housing accommodation, home-visiting, home nursing, domestic help, provision of meals, clubs. This group of old persons is helped chiefly by local authorities and voluntary organisations.

3. Old people who are unable any longer to live alone without being a burden to themselves or others. These may enter special homes for the elderly. In London alone there are nine such large homes with a total population of about 5,000 residents. These homes are chiefly provided by County Councils and County Borough Councils. There are also small homes which are provided and run by various voluntary organisations.

During the last few years considerable improvements have been made in most homes for old people, both large and small: yards have been turned into gardens; dayrooms into brightly decorated lounges; dining-halls have taken the appearance of restaurants; dormitories have been partitioned in one way or another; and everywhere paint, furnishings and pictures are new, bright, and cheerful (Bligh). The difference from the previously existing Poor Law Institutions is very great indeed.

In spite of all the progress made, so far it is impossible to accommodate and care properly for all the old persons who need prolonged home welfare services. During recent years, however, the urgency of this problem has been recognised by the State, local authorities, and voluntary organisations.

4. Old people who are on the border line between infirmity and chronic sickness. At this stage this group presents a problem which so far has not been solved satisfactorily.

5. Sick old men and women who are cared for in the hospitals, some of which place old patients in special geriatric sections or units.

Hospital Service for Old Patients.—Nowadays the hospital service is nationalised, and therefore care and treatment of old people in these hospitals is free of charge.

From the senior administrative medical officers of the Regional Hospital Boards a detailed account can be obtained of the geriatric service in their respective regions. This source varies somewhat between regions. In the following list the names of these Regional Boards and their addresses are given:

Newcastle Area, 1. Osborne Road, Newcastle-upon-Tyne.
Leeds Area 2. 29, Eastgate, Leeds.
Sheffield Area 3. Old Fulwood Road, Sheffield, 10.
East Anglian Area 4. 117, Chesterton Road, Cambridge.
Metropolitan Areas 5-8. 11, Portland Place, London.
Oxford Area 9. 43, Banbury Road, Oxford.
South Western Area 10. 5-6, Cotham Lawn Road, Bristol.
Wales Area 11. The Temple of Peace and Health, Cardiff.
Birmingham Area 12. 10, Augustus Road, Birmingham.
Manchester Area 13. 1, North Parade, Manchester.
Liverpool Area 14. 19, James's Street, Liverpool.
North Ireland Hospitals Authority. 58, Howard Street, Belfast.
Scottish Boards: N. Region, Raigmore Hospital, Inverness.
N. E. Region, 1, Albyn Place, Aberdeen.
E. Region, 430, Blackness Road, Dundee.
S. E. Region, 11, Drumsheugh Gardens, Edinburgh.
W. Region, 64, West Regent, Glasgow.

I am greatly indebted to the Senior Officer of the Seventh Metropolitan Area, Dr. Glyn Hughes, for explaining in detail this side of the State Health Service.

Dr. Hughes well represents a new type of state medical officer. He and his colleagues

are actually creating an altogether new state service. I am not a specialist qualified to criticise or praise this new service, but I must emphasise one point—the service has a good chance of becoming successful, if it has many other officers like those I met. I got the impression that they are not only hard workers, full of energy, enthusiasm, and belief in the new service, but they also know how to use their creative imagination, initiative, and skill in building an extremely difficult and complicated venture.

Geriatric Units.—In some hospitals the sections for old patients are separated into geriatric units, most of which are in the state of formation. A list of them together with some additional information is given in table 1.

For a detailed account as to how these units are run, it is advisable to write to their directors, or to visit the units personally. In particular, the following directors might be especially helpful: Professor R. E. Tunbridge, Dr. A. G. Anderson, Dr. T. H. Howell, Dr. M. W. Warren, Dr. T. S. Wilson, Dr. O. Olbrich and Dr. I. L. Cosin.

Professor Tunbridge and Dr. Warren will read detailed reports on British Geriatric Units at the Second International Gerontological Congress in St. Louis. Therefore, as a good example of the activity of these units, only the information given by Dr. Wilson will be cited:

> "Barncoose Hospital is the central department for geriatric treatment for the West Cornwall area. New cases of elderly sick are referred directly to this Unit and are admitted there for treatment, usually after domiciliary assessment. After treatment, those patients, who become fit enough (in the region of 50% of admissions), are returned to their homes or, where the home circumstances do not permit, are sent to welfare homes for old people. Those patients who eventually prove to be irremediable and who, for social reasons, are permanent hospital commitments, are transferred to the appropriate long-stay annexe in the vicinity of their homes. There is a liaison with the Local Authority for the purpose of providing domiciliary services such as home helps, health visiting etc., for those cases requiring such facilities. A system of follow-up of treated cases is shortly to be initiated, utilising the district Health Visitors."

Welfare Work of Voluntary Organisations.—At present there are many small and some large voluntary organisations which partly or wholly devote their services to old people. Their activities are very valuable. Some of them work in cooperation with geriatric sections of hospitals.

The following are the largest organisations: The National Corporation for the Care of Old People (33, Doughty Street, London, W.C. 1); the National Old People's Welfare Committee (26, Bedford Square, London, W.C. 1); Old Peoples' Homes Committee (296, Vauxhall Bridge Road, London, S.W. 1); Women's Voluntary Service (41 Tothill Street, London, S. W. 1).

These organisations are in close contact with the Ministry of Health and local municipal and county authorities, which encourage their establishment in all parts of the country and give certain financial assistance towards their maintenance.

The National Corporation for the Care of Old People was established by the Nuffield Foundation, in cooperation with the Lord Mayor's National Distress Fund, in 1947 with the aim of forming a central body, with sufficient funds to enable it to help the work of national and local voluntary organisations for the welfare of old people. Its main activity consists in providing grants for those voluntary committees and societies which are establishing homes both for able-bodied and infirm old people. Detailed accounts of the activity and plans of the Corporation are published in its annual reports.

The National Old People's Welfare Committee, with the help of the National Council of Social Service, has formed 12 regional, 36 county, and 517 local Old People's Welfare Committees. This organisation was established in 1940.

It is financed from various sources: the National Corporation (see previously), the

Ministry of Health, and voluntary donations and subscriptions. The Committee's assistance to old people is chiefly in the form of provision of Clubs, meal services, and visiting schemes,

The previously mentioned regional, county, and local branches of the Committee are serviced by a number of most useful publications. The quarterly *Bulletin* reports important events in various welfare organisations for old people, publishes official regulations, and gives advice for organisers of welfare gerontologic work. The following is a list of their other publications:

1. *Age is Opportunity*—a new Guide to Practical Work and for Welfare of Old People. Price 3/6d.
2. *Reports of Annual Conferences* and *Progress Reports.* Price 1/- or 2/-.
3. *Information Penny Leaflets* (free):
   - How to Start an Old People's Welfare Committee
   - Suggestions for Local Old People's Welfare Committees
   - The Organisation of a Visiting Service by an Old People's Welfare Committee
   - Notes for the Use of Visitors to Old People
   - Notes for Those Nearing and Over 60
   - How You Can Help Old People
4. *Booklets:*
   - The Need for Emotional Adjustments in the Elderly, by Dr. L. Cosin. Price 1/-.
   - Voluntary Organisations and the National Assistance Act, by Mr. J. Moss. Price 1/-.
   - 1949 and 1950 Statements of Work Being Carried Out for Old People by National and Local Voluntary Organisations throughout the British Isles. Price 2/- and 1/- each.

The Woman's Voluntary Service is described more fully so as to give a typical picture and example of the excellent work carried out by this and similar organisations.

Since 1945, 18 Residential Clubs have been set up by the W.V.S. for able-bodied men and women over 65 whose net income does not exceed £200 per annum. The purpose of these clubs, in which the number of residents does not exceed 40, is to provide a home life for old people who are otherwise unable to obtain one. Each resident has his or her own bed sitting-room with use of the communal lounge, and meals are taken at small tables in the communal dining room.

In addition two nursing homes have been opened into which residents from the clubs are moved when they become in need of nursing care and attention. A third property has been purchased for conversion into a home to take these old people who, while they are not in need of nursing care and attention, are no longer sufficiently able-bodied to remain in the residential clubs.

The capital costs of setting up these residential clubs, nursing homes, and the Half-Way Houses have been met by grants from such bodies as the Lord Mayor's National Distress Fund, the Guinness Trust, the National Corporation for the Care of Old People, voluntary donations, and gifts of money and goods from overseas friends of W.V.S.

The maintenance costs of the residential clubs are met from the fees charged to the old person, which in no case exceed £2.12. 6d. a week per person. If an old person who is considered suitable for a Club cannot afford the fees, it is possible to apply to the County or County Borough in which he or she was normally resident for supplementation under the National Assistance Act, 1949.

Each of these clubs and Homes are run by local management committees, under the chairmanship of a W.V.S. member, and with representatives of the local authority, National Assistance Board, clergy, medical profession, and other interested bodies. These local management committees are directly responsible to W.V.S. headquarters.

W.V.S. has also greatly expanded its work among old people living in their own homes. This work now covers over 700 Darby and Joan Clubs, 260 Meals on Wheels schemes, and a large amount of friendly visiting of old people in their own homes, local hospitals, and in the Public Health Service homes for old people.

The Darby and Joan Clubs, held generally in a church or similar hall, are open from one half-day a week to six days, and many clubs

TABLE 1. PRESENT GERIATRIC UNITS.

Hospitals to Which Units Are Attached	Name of Director	Year of Establishment	No. of Patients	No. of Physicians	Research
St. John's Hospital, London, E. 11	Dr. T. H. Howell	1946	70	2	Yes, see list of Dr. Howell's publications
Bermondsey Medical Mission Hospital, London, S. E. 1	Dr. T. H. Howell	1948	30	1	
South Western Hospital, London, S. E.	Dr. E. Carey	1949	120	3	On social conditions of old patients
West Middlesex Hospital, Isleworth, Middlesex	Dr. M. W. Warren	1936	180	4	Yes, see list of Dr. Warren's publications
St. James Hospital, Leeds	Dr. H. Droller, (with supervision of Prof. R. E. Tunbridge, M.D.)	1947	800	4	Yes, see list of publications of the Unit
St. Helier Hospital, Carshalton, Surrey	Dr. E. B. Brooke	1948	98	3	No
Withington Hospital, Manchester, 20	Dr. J. N. Greenwood	1950	460	5	No
City Hospital, Nottingham	Dr. W. Morton	1949	50	1	No
Cowley Road Hospital, Oxford	Dr. L. Cosin	1948	240	3	Starting
Barncoose Hospital, Redruth, Cornwall	D. T. S. Wilson	1948	295	7	No
General Hospital, Sunderland	Dr. O. Olbrich	1950	556	7	Yes, see list of Dr. Olbrich's publications
Morningfield Hospital and Woodend Home for Old Patients, Aberdeen	Dr. A. G. Anderson and Dr. A. W. Hendry	1945	150	2	No
Foresthall Hospital, Glasgow	Professor S. Alstead, M.D.	1949	640	7	On incontinence of urine
Alexandra Infirmary and Glen Coats Hospitals, Paisley, Scotland	Dr. T. Parker	1949	230	3	No
Belfast City Hospital, Belfast, N. Ireland	Dr. G. F. Adams	1948	270	3	No

are now serving a hot mid-day meal to their members. The aim of these clubs is to keep alert both the minds and bodies of the old people and in this way to prevent the onset of sedentary illness. The old people are encouraged to take an active part in the general runing of the clubs as well as in the recreations and amusements provided. Handicrafts are taught and the old people play games, produce their own concert parties, and enjoy those provided for them by visiting artists. The members of the clubs look to the W.V.S. helpers for help and advice with their problems.

The W.V.S. helpers visit the members of the Clubs in their own homes. This visiting is not confined to members of the Darby and Joan Clubs, but any old person, whose need is brought to the notice of W.V.S., is visited and helped in many ways—with advice, shopping, changing library books, etc. as well as alleviating the loneliness of old people, bringing friendship to old people living alone.

Hill Homes provide an example of a smaller, but excellent voluntary organisation. They have been established by and run under the efficient and devoted chairmanship of Mrs. Margaret Hill. At present there are five of these homes, with a total population of about 140 residents. Address: Mrs. M. Hill, 16 Bishopswood Road, London, N. 6.

Lack of space prevents a description of some of the other excellent organisations. However, if the reader would like to understand how during the last five or six years gerontologic organisations have been started and have grown both in local hospitals and the welfare service of a town, he sould read the Annual Reports of the *Aberdeen Old People's Welfare Council* (11, Albyn Terrace, Aberdeen). Its Chairman, Dr. A. Greig Anderson, is the initiator, organiser, and devoted worker both of the hospital and welfare work for old people in this Scottish town.

Summary

In conclusion to this review it is possible to say that gerontologic work in all its aspects, biologic, medical, and socio-economic, has started well in the U.K.

The future of the geriatric units is secure since they form a part of hospitals which are at present nationalised and therefore cared for by the state. Geriatric research will undoubtedly spread in the larger number of these units when special posts are established for permanent and properly trained research workers in the staff of the units, which in addition will receive a special allowance for actual research work.

The future of the organisations for the care of old people can also be regarded optimistically since voluntary work in this field is good, and the state, municipal, and county authorities are fully aware of the necessity of supporting and developing them by all the means at their disposal.

On the contrary, the future of the Gerontological Experimental Research Units is uncertain since they are existing on temporary, inadequate grants. This is most unfortunate because the solution of the main problems of old age can be achieved by experimental research work only.

Gerontologic experimental research carried out in some university laboratories or hospitals also has no special permanent financial support, which is as unfortunate as in the case of Gerontological Research Units.

However, since governmental, medical, scientific, and public circles have become aware of the urgency and importance of the problem of old age both for the nation and for the individual, there is reasonable hope that all the deficiencies will be remedied sooner or later. Personally I believe that this will happen sooner rather than later.

V. Korenchevsky

GERONTOLOGIC RESEARCH IN FRANCE, 1949-1950

The Conference for the study of aging of the French population, held in Paris, April 22 to April 24, 1948, called governmental attention to the increasing national senescence and its socio-economic implications (3). Following the publication of the Proceedings of this Conference and Daric's book (7) on the evolution of the age composition of the French working class, interest in gerontology has slowly increased.

Some scientists and social workers began original investigations—either occasionally or for longer periods—on gerontologic problems. Unfortunately the lack of funds has prevented the development of any long-term research projects. However, some research activities on aging problems have been completed during the last two years.

At the National Institute for Demographic Studies, Vincent (14) began a study of the rates of mortality for the aged. The preliminary results of that investigation were presented at the twenty-sixth meeting of the International Statistical Institute, held in Bern, September, 1949. A table of mortality rates at advanced ages for the French population (1920 to 1936) was constructed, using the method of "extinguished cohorts." The data indicate the trend of mortality for most advanced ages. Contrary to generally accepted opinion, the quotients do not tend towards a fixed limit but rather seem to increase more and more rapidly at about 100 years and thereafter. These results are confirmed by tables calculated for the Swedish population for the years 1914 to 1945. Vincent sets the problem of a statistical "age limit" specific for a given population during a given period.

In the laboratory of animal biology of the Sorbonne, May (11) investigated the influence of human plasma on the growth in vitro of nervous cells from chicken embryos. Comparing plasma of people aged 20 to 93 years old, May found that, even in the presence of embryonic extract, 29.5 per cent of the cultures failed to grow when plasma from people 66 to 93 years old was used against 15 per cent with plasma from people 20 to 30 years. The amount of growth inhibiting substance of the plasma thus seems to increase between maturity and old age.

At the Garches laboratory of the Pasteur Institute a study of the growth promoting action of placentary extracts on tissue cultures was initiated by Delaunay, Wang, Bardou, and Courtiol. The technique used is described in a preliminary paper (8); extracts of the placenta have a definite growth promoting action on chicken embryo fibroblasts. Biochemical study of the responsible factors is now in process.

The Departments of Physiology and Medical Biology of the School of Medicine, Paris University, jointly began a study of the aging processes of skeletal muscle in man. The reflex resting tonus of the biceps has been studied in 143 females and 73 males aged 18 to 94 years old. The apparatus recently described by Fleisch and Grandjean (10) was used. Preliminary results (2) show a significant decrease in the values of the resting tonus in people aged 60 and over. This senile hypotonia is not fully explained by the anatomic involution of the muscle. The computation of partial correlations between age, resting tonus, and muscle size (computed after its maximum diameter) shows that some qualitative modification of the tonic contraction must be taken into account.

G. and A. Bourguignon, in the electrophysiologic laboratory of La Salpétrière Hospital, are now investigating the variations with age of the biceps fatigability. Using their chronaximetric fatigue test, they found that in healthy people over 55, the muscle is tired by repeated stimulations which do not affect the biceps of younger individuals. If this muscle is stimulated 10 times in three minutes by a current of twice the threshold strength and of ten seconds' duration, the chronaxie values

do not change in normal young people. However, in people over 55 chonaxie values temporarily increase.

The rate of healing of experimental wounds has been studied in the rat by Bourlière and Gourévitch (5). Sixty-four female rats, aged 3 to 30 months, were used in these experiments. In the young animals (aged 3 to 7 months) healing was significantly more rapid than in the adult rats (10 to 14 months), but the older animals (18 to 30 months) did not differ significantly from the adult rats. The rate of growth of the lower incisors did not vary in the rats aged 2 to 24 months.

Bourlière and Gourévitch (4) have studied the influence of age on the enlargement of the pituitary under the influence of stilbestrol. In young rats growth inhibiting effect of stilbestrol implantation varied markedly with age. In older animals (more than 400 days old) pituitary adenomas, consisting mainly of chromophobe cells, seemed to develop more rapidly and became larger than in younger animals.

Coullaud (6) has investigated the hippuric acid synthesis, using Quick's intravenous hippuric acid test, in 80 people aged 62 to 93 years. His data confirm the results published by Stern and his associates (13) and show a definite decrease of the hippuric acid synthesis in old people. This faulty synthesis seems mainly to be caused by an impairment of the senile organism's ability to furnish glycine rather than by an impairment of the mechanism of conjugation.

Since the first publication by Sigwald and his associates (12) on the use of diethylamino-2-ethyl-N-dibenzoparathiazine in the treatment of Parkinson's disease, several new drugs have been synthesized in French laboratories. A review of their effects on both the arteriosclerotic type and the postencephalic type of Parkinson's disease has been published by Durel (9). Forty-four out of 180 patients were greatly improved, 71 improved, and 54 somewhat better after treatment with diparcol.

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François Bourlière

GERONTOLOGIC REVIEWS

SOME COMMUNITY PLANS FOR THE CARE OF THE AGED

JOSEPH KLEIMAN

Today there exists a wide gap between available services in the community and unmet needs of the aged. This is particularly evident in the case work field, which is considered the primary arm of social work. Aside from public assistance, which is well organized and primarily meets the economic need, there is comparatively little in either facilities or services that social work offers the aged.

In fairness it should be stated that family agencies have made available to their aged clients such services as counseling, housekeeper, and referral. These have taken on various forms in accordance with the philosophy of the agency towards their aged clients. Those few agencies that have recognized the problem to the point of organizing a separate unit with special supervision and attention to this particular problem have been able to report satisfactory results with their older clients.

The attitude of neglect is also reflected in the lack of courses or field placements by schools of social work, which does not give the students an opportunity to acquaint themselves with the distinct differences that working with the aged entails. Unless these aspects of the problems are explored with objectivity there can be no real understanding or progress in social work in dealing with the aged. The possible goals that may have to be set by the case worker may be stated as continuing relationships with the family group or a psychologic and/or physical separation. It may require the sensitive understanding of a trained case worker to accomplish these ends.

The Jewish Community Services of Queens-Nassau developed as part of its special services for the aged a private residence program which is a new adaptation of the foster home placement for children. The plan operated in the borough of Queens, New York City, called for a careful selection of good homes that would accept the older clients. The standards for this placement process were high both in the boarding rate, which was $130 per month, as well as in the requirements of the home, which included for the client a private room, good food, privileges of visitors in the home, use of the telephone, and supervision by the agency. The clients to be served by this program were roughly those seeking permanent, interim, or temporary placement. The latter two groups were composed of persons who were either on a waiting list for a home for the aged or had to make special arrangements to tide over an exceptional situation.

The requirements for the client were as simple as possible—financial eligibility and suitable personality. The financial requisite was the client's ability to reimburse the agency with a minimum of $70 a month, a figure set because it was the equivalent of old age assistance grant paid by the Department of Public Welfare to those eligible clients living in boarding homes. The personality requirements consisted in the client's ability to assume responsibility and to make adjustment to a new family group. Thirty-two persons were placed in fifteen months and after a year of operation, the agency believed that their program of private residence proved its value (*2*).

Another unique service for the aged in New York City is the Home Care project, which grew out of a requirement for service to those aged individuals who preferred to remain in their own homes as long as possible. They needed some comfort and psychologic security by having the services of a housekeeper or

visiting physician, a social case worker, a visiting nurse, or volunteer aide available when occasion arose.

Three social agencies cooperated in this service: the Central Bureau for Jewish Aged, the Home for Aged and Infirm Hebrews, and the Jewish Family Service. The Home for the Aged selected the clients and supervised them through their case work staff. The project was concentrated in a geographic area near the Home so that maximum use of all services could be made. A panel of physicians on the staff of the Home was available for any medical needs which might arise. The neighborhood and community facilities for the aged were also utilized as much as possible. The Family Service provided the housekeeper service and supervised this part of the program. The Central Bureau had the role of coordinating and the fiscal agency the disbursement of funds, planning, and evaluating the results of the project.

A number of communities have instituted apartment projects for older people that are either supervised by a family agency or are operating as an extension service of a home for the aged. The Tompkins Square Apartment Project of New York, extension facilities in Cleveland, Baltimore, and Chicago are good examples. The old people either live in their own private apartment or are coupled with others in an apartment, but utilize a common dining room in the building and are provided with all necessary services. Either neighborhood facilities are opened up for them for group recreation or the Home facilities are made available as the case may be. Medical services are also provided, adding a great deal to the security of the old people (1).

It should be stated that the operation and services of homes for the aged have changed in the last decade. Their interest and emphasis has been directed more towards provision of special care for the chronically ill, who as a group need more institutional care than any other segment of old people. Many homes have built extensive hospital facilities and others have arranged for such services either with a general hospital or convalescent home. Quite often the hospital facilities of a home for the aged serve as a center for research in geriatrics. Physical therapy in addition to medical care is extensively being used. Much also has been done in providing an active recreational program as well as occupational therapy for the residents. These programs are most successful where the residents themselves participate in the planning and execution.

Administrators in these homes believe that, in addition to the care on several levels that they provide, their contribution would be most effective in the degree that they can develop as centers of research and spearheads for more intensive study of the older person. Suggestions have been made to open the doors of the home in order to allow the older people in the community to participate for part of the day in home activities.

Another phase of the care of the elderly chronically ill was instituted by the Montefiore Hospital three years ago through their own home care program. The patient is discharged from the hospital as soon as possible but continues to receive medical care, social service follow-up, occupational therapy, and physical therapy in his home. In other words, an attempt is made to have the doctor re-enact the role of the old general practitioner, who was confidant, counselor, friend, and doctor all in one. They have found that many patients recuperate much faster with the extra attention given to them under this supervision and the cost per day is a quarter of what it would be in the hospital.

Important residential facilities for old people at the present time are provided by commercial nursing homes and boarding homes, which fulfill a real need for many old people who cannot obtain these services in any other way. They should be encouraged to continue their operation under the supervision of an over-all community plan. Where they are not supervised at all or where supervision or licensing is confined to some perfunctory

visit, they may be tempted to provide only the minimum of services to the old people under their care. The primary responsibility of the community and its planning agencies is to provide supervision either through a legislative program strictly enforced or through public opinion that will organize a voluntary system on the part of the commercial homes for meeting high standards set up by the community.

The older person will progressively become a factor economically and socially. Worth while beginnings were made in the last decade in the study and in the understanding of this new social age group. However, more professional and lay people in social work have to become oriented to this problem. There is reason for optimism in dealing with the task but this must be accompanied by a legitimate amount of restlessness and willingness to mold new facilities for the rising needs. Above all there must be an interest in having the older citizens participate in any plans and programs that are designed to serve them.

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BOOK REVIEWS

INDEX OF GERONTOLOGIC LITERATURE

A CLASSIFIED BIBLIOGRAPHY OF GERONTOLOGY AND GERIATRICS, by Nathan W. Shock, Stanford University Press, Stanford, California, 599 pages, $15.00.

This comprehensive bibliography, the first of its kind in the field of gerontology, represents a most valuable contribution, which will be of the greatest assistance to all workers in the field of gerontology and geriatrics.

The volume includes 18,036 references dealing with all disciplines having relation to old age. The material is subdivided under the headings of gerontology (general considerations), biology of aging, organ systems, geriatrics, psychologic processes, social and economic aspects, and miscellaneous. The criteria for the selection of subjects included in the bibliography are clearly and logically stated in the introduction. Although the choice may not correspond completely to that of several other workers in this field, the science of gerontology and geriatrics is by its nature not sharply delimited, and no valid arguments can therefore be advanced against Shock's selections.

The fact that the bibliography is being kept up to date by quarterly supplements published in the Journal of Gerontology enhances the value of this notable accomplishment. In spite of the completeness of the present bibliography, the reviewer would like to point out that many observations of great gerontologic significance probably will escape inclusion in any index selected according to titles, since important biochemical and clinical findings in older individuals are often contained in publications in which the gerontologic findings are merely incidental.

This painstaking care and zealousness of the compiler is evident in many ways, for instance in the inclusion of material not readily accessible and in the listing of papers that have appeared in the Russian and other Slavic languages.

The bibliography is excellently printed and contains only occasional misprints, which would seem almost unavoidable in a publication which covers the titles in so many foreign languages.

The author should be greatly commended for having engaged in such an exhaustive undertaking and for the excellent way in which this work has been completed.

M. CHIEFFI

A WHO'S WHO OF AGING

TRENDS IN GERONTOLOGY, Nathan W. Shock, Stanford University Press, Stanford, California, 1951, 153 pages, $2.50.

The timeliness of Dr. Shock's survey of gerontology in the United States and abroad is attested to by the fact that the reviewer has had several requests during the last few months for just such material. Each of these requests came from administrators who were concerned with such questions as where research on aging is being done, who is doing research on aging, and what trends, if any, exist in gerontologic research.

Preparation of this book could only have been a labor of love. The activities in gerontology are widely dispersed. Except for a few major centers, research on aging, as Dr. Shock's book documents, is at present a highly individual pursuit. This, to some extent, Dr. Shock deplores. Indeed, his principal recommendation is that a national institute of gerontology, presumably within the framework of the U. S. Public Health Service, be established.

As a matter of principle, it is difficult to greet this recommendation with any measure

of enthusiasm. To establish a gerontologic institute is to organize research on aging. Organization, by definition, means loss of individuality—the latter is essential to creative research.

Exception may be taken to Dr. Shock's definition of aging, "All living matte changes with time in both structure and function, and the changes which follow a general trend constitute aging. Aging begins with conception and ends only with death." This definition would place gerontology as the fourth dimension of biology. It is not what we think of as aging in the literal sense, and it might be wiser to distinguish between the growth phases of the life cycle and those phases which are characterized by progressive, time conditioned loss of function. The latter is aging and is the phase of the life span that pre-occupies modern gerontologists. Aside from these comments which are, of course, a matter of opinion, Dr. Shock has done a first rate job of surveying modern gerontology and his book is certain to be generally useful.

A. I. LANSING

CARE OF THE ELDERLY IN GREAT BRITAIN

PRACTITIONER, Symposium on the Care of the Elderly, vol. 165, no. 986, August, 1950, pages 111-163, 4 shillings. Copies are obtainable from The International Practitioner Co., 507 Fifth Ave., New York 17, New York.

The content of this issue of the Practitioner is devoted chiefly to the care of the elderly. In an introductory paper, Lord Amulree discusses the employment of elderly workers. He points out that as a consequence of the war, during the year 1944, 54 per cent of men of pensionable age in Oldham held employment and that in Wolverhampton this figure was as high as 87 per cent and emphasizes that the generally held contention that it is not possible for older individuals to engage in new occupations is false. He believes that older workers should not be made to feel that they are given too much consideration during their work but recommends that the older employees start work a little later than the other workers and leave earlier to avoid the traffic rush hours.

Paul Gibson gives a review of the aging heart and stresses the value of sphygmanometry. He considers pulse pressure a most useful indication of aging; in the absence of aortic regurgitation and thyrotoxicosis, a pulse pressure over 70 mm. Hg. suggests an inelastic aorta. The frequent occurrence of a silent gap by blood pressure measurements in old individuals should be remembered. The different types of arteriosclerotic heart disease are also discussed. It is recommended that caution be exercised in the use of drugs in old persons on account of the high frequency of idiosyncracy in this age group. Morphine should be given in doses only half of those employed in younger individuals.

The subject of pulmonary disease in the elderly is treated by James Livingstone. In emphysema, physical therapy is recommended in order to improve chest mobility, a form of treatment which frequently has been found to be of decisive value. In cardiac asthma caused by left ventricular failure restriction of fluids and injection of mersalyl twice weekly is suggested.

Sydney Thomson has contributed the chapter on skin disorders in the elderly. The common skin diseases in old age are considered and certain routine methods of care which may be of advantage to both the healthy and diseased skin in the elderly are indicated. Since soaps have a defatting action they should be as bland as possible and used as sparingly as is consistent with cleanliness.

A review of genito-urinary disturbances in old age is given by H. Winsbury-White. The various prostatic diseases, diverticulum of the bladder and bladder concrements, papillomas

and carcinoma, and the surgical conditions of the kidney and external genitalia are reviewed. In order to avoid the development of the usually very serious bladder infection in the aged, the author warns against all instrumental examinations of the bladder, especially in men, unless such examinations are considered absolutely necessary. As a conclusion of his survey, the author states that an old patient who is in possession of vigor and vitality should in spite of his advanced years be offered the same opportunities as a younger person for relief through surgery.

An important chapter dealing with diet in old age is written by G. Langley. This author emphasizes the not generally known fact that old individuals, because of smaller muscular activity, have a considerably lower caloric need than younger persons. As a general rule, Langley recommends that old persons should eat practically the same diet as young subjects, except for certain limitation with regard to intake of sodium chloride. It is also pointed out that the diet usually has a too low vitamin content and that especially thiamine and ascorbic acid are lacking. The danger associated with the development of obesity in old age is stressed.

In a final chapter the well-known British geriatrician, Marjory Warren, has given an excellent review of the facilities available for the care of the elderly in the home. She emphasizes the desirability of keeping the aged persons in their own homes and refers to the domiciliary services which provide assistance for the old person: 1) relatives and friends, 2) consulting servcies from the hospital, 3) the National Assistance Board, 4) local authorities, and 5) voluntary organizations.

The services of the local authorities include health visitors, district nurses, home help, welfare of the blind, supply of medical aids, and welfare service. Of greatest significance are the voluntary organizations which make possible the provision of medical aid, wireless sets, library service, meals on wheels, visiting, clubs, occupational and diversional therapy, services for the blind, the deaf, and the dumb, homes, physiotherapy in the home, domiciliary laundry service, and chiropody service. Dr. Warren points out that it is very encouraging to note to what large extent the National Health Service Act enforced in July, 1948, has improved the condition of the aged in Great Britain.

T. Geill

MEDICAL PSYCHOLOGY

RELATION OF PSYCHOLOGY TO MEDICINE, Wayne Dennis (editor), University of Pittsburgh Press, Pittsburgh, 1950, 189 pages, $3.75.

Eight lectures on the relation of psychology to medicine provide the content of the book. The addresses were delivered at a University of Pittsburgh conference held on February 9-10, 1950. As might be expected, chief emphasis is placed upon problems common to psychiatry and clinical psychology. However, attention also is given to psychology's role in public health work, medical education, neurologic research, and gerontologic studies. An interesting chapter on the relation between medicine and psychology in England has been contributed by Professor Hans J. Eysenck. The other chapters are based on the remarks of Dr. Wayne Dennis, Dr. Robert H. Felix, Dr. Carlyle Jacobsen, Dr. Robert A. Patton, Dr. Yale D. Koskoff, Dr. Paul E. Huston, and Dr. Nathan W. Shock.

In sketching the relationship between psychology and public health, Dr. Felix recognizes the importance of the problems of an aging population. Cultural factors as well as somatic changes influence behavior in the later years of life. Among the gerontologic problems which require the research efforts of psychologists, Dr. Felix identifies the following: the aging of mental abilities, change of the self-concept in

old age, cultural expectations as factors in psychologic functioning, vocational activity type as a determinant of intellectual status, and the genesis of attitudes of invalidism. Dr. Felix believes that psychologists can aid in developing a sound and effective program of education directed to the aged and their younger associates.

Speaking on the relation of psychology to gerontology, Dr. Shock reminds us by reference to population statistics of the growing importance of the subject. He concludes that we face economic and possibly political catastrophe if psychology and its sister sciences do not soon develop a fund of basic knowledge which will permit the accurate assessment and the fullest utilization of older persons.

Shock points out that the psychologic literature shows a striking lack of systematic investigations and that some of the most important problems in the field are unworked at the present time. Much of the current research involves use of interviews, questionnaires, and rating scales; often methods of questionable validity are employed. Shock indicates the difficulties involved in obtaining suitable older adults as subjects, particularly "normal" individuals living in their own homes. He describes in some detail the achievements and plans of the U. S. Public Health Service gerontologic research program headed by psychologist James E. Birren of Baltimore.

This small book contains much information of value to those who are concerned with psychophysiologic problems. Although it is not a comprehensive or a very systematic treatment of the subject of medical-psychologic interrelationships, it will be read with profit by all who are engaged in interdisciplinary research.

O. J. KAPLAN

VITAL STATISTICS

THE BURDEN OF DISEASES IN THE UNITED STATES, Alfred E. Cohen and Lingg Claire, Oxford University Press, New York, 1950, 129 pages + 5 tables in separate cover.

In this book most of the statistical evidences concerning the ill-health of the nation is compiled. The book, however, is something more than a manual, the tables and the figures serving as an illustration to a fundamental and fascinating text. It is very remarkable that every mathematical calculation is omitted. The conclusions inferable from the figures are presented to the reader thoroughly and critically, but still conceived in plain terms.

First a survey is given of the evolution of the notification of death in the United States, the present status, and the sources of error connected with conclusions derived from the material. Most of the book deals with the size and the composition of the population, the number of deaths, the death rate, and the leading causes of death, especially with their changes over a period of years.

Interesting calculations of the future situation—the authors of course being aware of the hazards involved—are presented, showing that from now on the population of those under 15 years of age will decline steadily, while the group over 64 will nearly double during the following thirty years, constituting one-eighth of the total population at that time. Further facts and considerations of interest to the gerontologist should be mentioned: the age-specific death rate for people over 40 years from cardiac, vascular, renal, and cerebral causes put together has remained almost constant during several decades; the death rate due to infections in the age group over 75 is as high as in the pre-school age, or even higher; the death rate for people over 75 years old from falls is higher than the rate due to all accidents together in any other age group.

The authors regret that the death cause, senility, is so rapidly disappearing from the

death lists. This trend implies, they say, that too much emphasis is laid upon the vascular nutritive system. There must be an item, senility or an equivalent one, to designate death due to aging processes in the cells themselves.

The problem of disease incidence without regard to death (morbidity) is also given consideration. The five extensive health surveys (e.g., the Hagerstown canvass) are analysed and compared. So far, no data are available which would justify a general conception of all diseases and their frequency in the United States. For instance, very little is known about the number of cases of mental disorders outside the hospitals.

The book contains many elucidating tables. Some of the bigger ones—including a table showing the death rates in foreign countries—are colored and collected as folders in a separate cover. They are invaluable, for instance, as material for teaching purposes. However, the reader has to distinguish between sixteen different colors, several of which are very similar to each other.

The book is written with authority, and the authors express their personal opinion very convincingly. This monograph deserves to be recommended strongly, especially to practitioners, specialists in the fields of medicine, public hygiene, and geriatrics, and to biologists and statisticians.

P. From Hansen

SOCIOLOGY AND OLD AGE

THE SOCIAL AND BIOLOGICAL CHALLENGE OF OUR AGING POPULATION, PROCEEDINGS OF THE EASTERN STATES HEALTH EDUCATION CONFERENCE, 1949, Columbia University Press, 183 pages, $2.75.

This is part of a series of books that have come out of the proceedings of the New York Academy of Medicine's health conferences. The conferences, which have been presented annually since 1940, deal with various phases of health education. The speakers are experts in their fields and the discussions are designed to assist those who are not specialists to understand the problems involved in a particular field and how to control them.

In this instance, we hear from authorities in the field of public health, care of the chronically ill, population control and analysis, clinical medicine, biology, nutrition, and genetics, who have come together to consider "the problems posed by the large and growing group of the population who have outlived their usefulness to society." The principal objective of the conference was the achievement of a multidimensional definition of the problems and the scope of the papers presented was intentionally broad. The interest of the conference lies, not in aging as experience or as process, but in premature aging. "The disparate aging in its various components which disrupts the organism, reduces its effectiveness, and in so many instances allows for no more than mere existence."

This group of papers is intended as an orienting historical review of the rise and origin of the problems, a summary of what we do know of the biology of aging, and a compact exposition of our knowledge of the social, economic, industrial, psychologic, and other components of the aging experience.

M. Galpern

SURVEY OF OASI BENEFICIARIES

RESOURCES OF OLD AGE AND SURVIVORS INSURANCE BENEFICIARIES IN PHILADELPHIA AND BALTIMORE, 1949, Federal Security Agency, Social Security Administration, Bureau of Old Age and Survivors Insurance, Division of Program Analyses, May, 1950, 33 pages, photo offset printed, paper bound.

During the last three months of 1949, representatives of the Bureau of Old Age and

Survivors Insurance interviewed 560 typical beneficiaries in their homes in Philadelphia and Baltimore to obtain first hand information about their post-entitlement experience, with special reference to the retirement resources of the beneficiary group. This study, one of a series of similar investigations made by the Bureau of Old Age and Survivors Insurance since 1941 in twenty cities' groups in six survey areas, gives a great deal of helpful first hand material about the finances and living arrangements of a group of elderly people. Of particular interest is the data about employment and other sources of income and about living arrangements.

Somewhat over one-tenth of the aged persons in this group had no income except their insurance benefits. Approximately one-fourth of the beneficiary groups' total money income were derived from insurance benefits. Almost a quarter of all the male primary beneficiaries were employed at some time during this survey year. One-tenth of the male primary beneficiary groups received public assistance during the survey year.

Nearly half the male primary beneficiaries and their wives were married, shared a home with children, or other relatives. One-fourth of the nonmarried men were rooming and boarding. The nonmarried men who shared a home with others, as a rule, were living in a home of relatives, but the couples were more likely to have the relatives living with them.

The largest independent incomes from reasonably permanent sources in addition to insurance benefits were received as pensions or other retirement pay from former employers. Other sources were Spanish American and World War I pensions, Union pensions, National Service Life Insurance payments following the death of a son in the armed forces, annuities, and inherited trust fund. Sometimes, however, even the total income of all the members of a family of which the beneficiary was a part was less than the amount required for a minimum level of living and still no one in the family received help from outside. Family pride, ignorance of the public assistance program, and ownership of property, as well as disqualifying statutory regulations, restrained some low income beneficiaries from asking for the help they needed.

The survey finds that in 1949 probably considerably more than half of the aged beneficiaries in Philadelphia and Baltimore were living above their maximum local public assistance level, but their means, on the average, were so limited that progressive depletion of resources is inevitable. The report states that to conclude that they will eventually seek public assistance is far from warranted. They may not have much in the way of reserves but the adjustments they will make as any one resource changes are not predictable. One thing seems certain, they will not ask for help either from public funds or their own relatives if they possibly can manage without it. Many beneficiaries indicated that they were hoping for increased old age and survivors insurance benefits as a solution to their most pressing problems.

M. GALPERN

BOOKS RECEIVED

Books received since February 1, 1951, are acknowledged in the following list. In so far as space and time permit, some will be selected for review in a later issue, but it is unlikely that all will be reviewed.

The Best Is Yet to Be, by Paul B. Maves, the Westminster Press, Philadelphia, 1951, 96 pages, $1.50.

Classified Bibliography of Gerontology and Geriatrics, by Nathan W. Shock, Stanford University Press, Stanford, California, 1951, 599 pages, $15.00. (Reviewed in this issue, page 293).

Directory of Recreation Facilities for Older People, Welfare Council of New York City, 44 East 23 Street, New York 10, New York, 1951, 32 mimeographed pages, single copies 25¢, 10 copies $2.25, 50 copies $11.25. (See Current Comment, this issue, page 273).

Trends in Gerontology, by Nathan W. Shock, Stanford University Press, Stanford, California, 1951, 153 pages, $2.50. (Reviewed in this issue, page 293).

INDEX TO CURRENT PERIODICAL LITERATURE

NATHAN W. SHOCK
Gerontology Section
National Heart Institute
National Institutes of Health

The subject categories are those in *A Classified Bibliography of Gerontology and Geriatrics* by Nathan W. Shock published by Stanford University Press, Stanford, California (1951). Only major headings are used and the Roman numerals correspond to those given in the bibliography. In so far as possible, references are classified according to organ systems. Thus most of the material on Geriatrics will be found under the organ system involved in the disease. Cross references are indicated by number at the end of each section. When available, abstract references are given *(B.A.—Biological Abstracts; P.A. — Psychological Abstracts; and P.I.—Population Index).* Abbreviations for journals are those used in *A World List of Scientific Periodicals Published in the years 1900-1933,* 2nd Edition. For journals not listed, abbreviations were devised according to the general rules used in the above source. It is impossible to cover all journals and list all papers concerned with aging and the aged. Authors and publishers are requested to call attention to publications or to send reprints to the Gerontology Section, Baltimore City Hospitals, Baltimore, Maryland.

GERONTOLOGY

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3100. New York Academy of Medicine: *The social and biological challenge of our aging population; proceedings of the Eastern States Health Education Conference, March 31 — April 1, 1949.* Columbia Univ. Press, N. Y., 1950, 183 pp.

3101. Oliver, J.: Structural aspects of the processes of aging. *In: The Social and Biological Challenge of Our Aging Population.* Columbia Univ. Press, N. Y., 1950, pp. 25-43.

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3105. Shock, N. W.: Gerontology (later maturity). *In:* C. P. Stone (Editor), *Annual Review of Psychology.* Annual Reviews, Inc., Stanford, Vol. II, 1951, pp. 353-370.

3106. Shock, N. W.: *A classified bibliography of gerontology and geriatrics.* Stanford Univ. Press, 1951, xxvii, 599 pp.

3107. Shock, N. W.: *Trends in gerontology.* Stanford Univ. Press, Stanford, 1951, ix, 153 pp.

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IV. Longevity

(case reports, drugs, heredity, marriage, national groups, occupation, and sex differences)

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